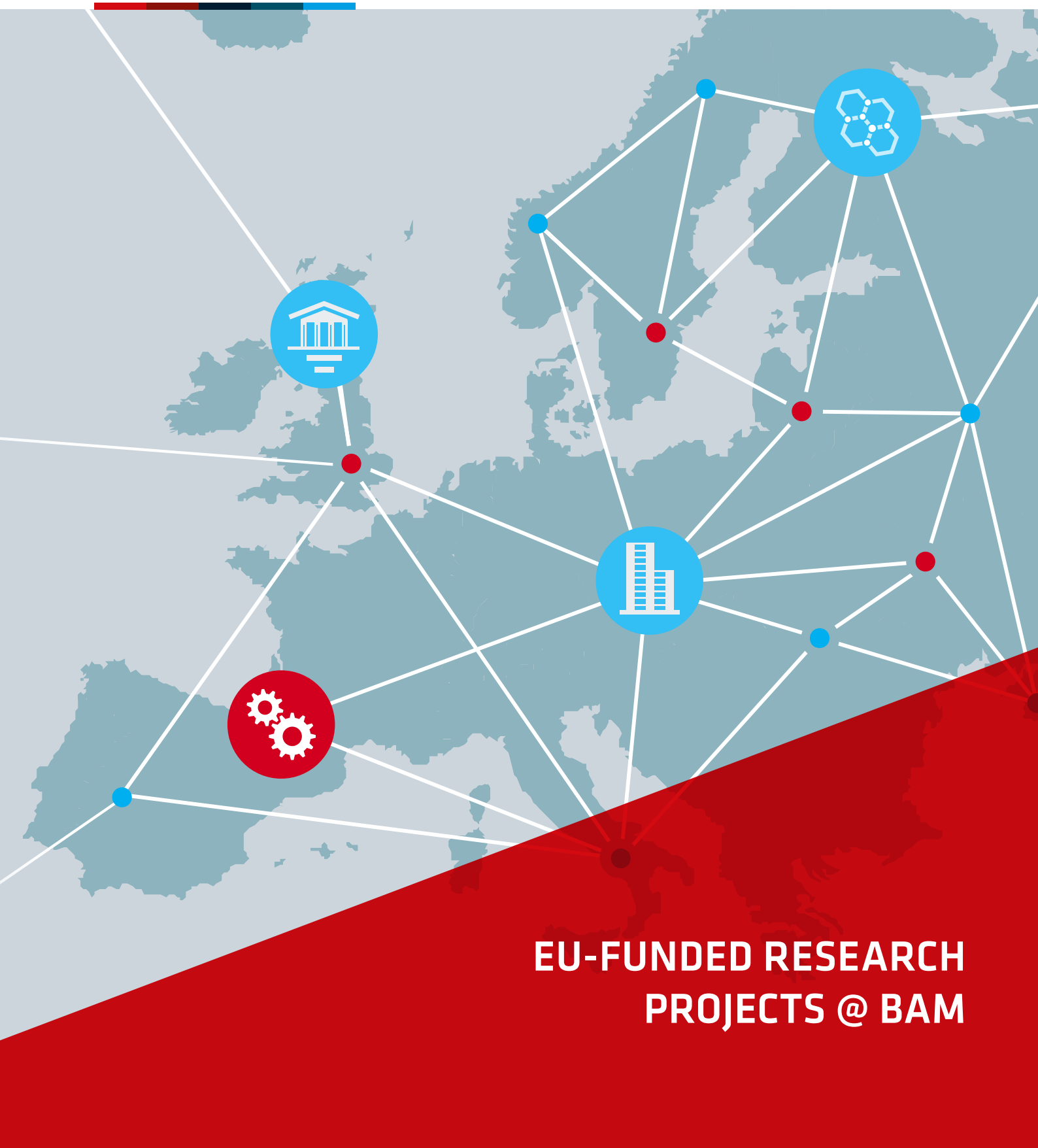
BAM

Bundesanstalt für
Materialforschung
und -prüfung

Sicherheit in Technik und Chemie



EU-FUNDED RESEARCH PROJECTS @ BAM

OVERVIEW

Introduction **5**

Marie S.-Curie Actions **6**

Participations in HORIZON 2020 – Marie S.-Curie Actions 7

GlycoImaging – Imaging and detection of tumor-associated glycan structures on tumor cells 8

BioCapture – Smart capture phases for proteomics, glycomics and biomarker assays 9

INFRASTAR – Innovation and Networking for Fatigue and Reliability Analysis of Structures – Training for Assessment of Risk 10

FiBreMoD – Fibre break models for designing novel composite microstructures and applications 11

Mummering – MUltiscale, Multimodal and Multidimensional imaging for EngineeRING 12

Nanocytox – Development of Novel Analytical Methods to assess Nanoparticle cytotoxicity 13

AMITIE – Additive Manufacturing for Transnational Innovation in Europe 14

Participations in FP7 – Marie S.-Curie Actions 15

IsoNose – Isotopic Tools as Novel Sensors of Earth Surface Resources 16

TRIPOD – Triple Energy saving by use of CRP, CLT and podded propulsion 17

Horizon 2020/FP7 collaborative projects **18**

Participations in Horizon 2020 – Collaborative projects 19

LiNaBioFluid – Laser-induced Nanostructures as Biomimetic Model of Fluid Transport in the Integument of Animals 20

HERCULES-2 – Fuel flexible, near-Zero emission, adaptive performance marine engine 21

CONSENS – Integrated Control and Sensing for sustainable Operation of Flexible Intensified Processes 22

ACEnano – Analytical and Characterisation Excellence in nanomaterial risk assessment 23

SCALE – Production of Scandium compounds and Scandium Aluminium alloys from European metallurgical by products 24

EC4SafeNano – European Centre for Risk Management and Safe Innovation in Nanomaterial Nanotechnologies 25

TAHYA – TAnk HYdrogen Automotive 26

CellFreeImplant – Cell-free Ti-based Medical Implants due to Laser-induced Microstructures 27

Participations in FP7 – Collaborative projects 28

Best Paths – Beyond State-Of-The-Art Technologies For Power Ac Corridors And Multi-Terminal Hvdc Systems 29

NANOMAG – Nanometrology Standardization Methods for Magnetic Nanoparticles 30

H-House – Healthier Life with Eco innovative Components for Housing Constructions 31

BRIMEE – Cost effective and sustainable bio-renewable indoor materials with high potential customization and creative design in energy efficient buildings 32

NANO DEFINE – Development of an integrated approach based on validated and standardized methods to support the implementation of the EC recommendations for a definition of nanomaterial 33

EMPIR **34**

EMPIR participations – Collaborative projects 35

nPSize – Improved Traceability Chain of nanoparticle Size Measurements 36

MicroProbes – Multifunctional ultrafast microprobes for on-the-machine measurements 37

AdvanCT – Advanced Computed Tomography for dimensional and surface measurements in industry 38

ESCoShell – An ISO Technical Report on the use of Electron Spectroscopy for Measurement of Core-Shell Nanoparticle Shell Thicknesses 39

ALCOREF – Certified forensic alcohol reference materials 40

HyMet – Hybrid metrology for thin films in energy applications 41

AEROMET – Aerosol metrology for atmospheric science and air quality 42

ReMIND – Role of metals and metal containing biomoleculesin neurodegenerative diseases such as Alzheimer's 43

MetVBadBugs – Quantitative measurement and imaging of drug-uptake by bacteria with antimicrobial resistance 44

TF Standard – Developing a Standard for Valid Methodology for the Characterization of Functional Alloy Thin Films 45

Strength ABLE – Metrology for large-scale engineering of materials 46

ENVCRM – Matrix reference materials for environmental analysis 47

Innanopart – Metrology for innovative nanoparticles 48

MeTra – Traceability for Mercury Measurements 49

VITCEA – Validated inspection techniques for composites in energy applications 50

ThinErgy – Traceable characterization of thin-film materials for energy applications 51

KEY-VOCs – Metrology for VOC indicators for air pollution and climate change 52

Joint Programming Initiatives (JPIs) and ERA-Nets **53**
JPI participations – Collaborative projects 54
Beat-AMR – Partnership against Biofilm-associated Expression, Acquisition and Transmission of AM 55
ERA-Net participations – Collaborative projects 56
TARQUS – Modeling-aided design of a TernARy Quantum dot-based platform for multiplexed cell analysis 57
EI-GEO – Environmental Impact of geosynthesis in aquatic systems 58
BASH-TREAT – Optimization of bottom ash treatment for an improved recovery of valuable fractions 59
NanoHype – Nanoparticle Hybrid Materials Using Plasmonic-Enhanced Upconversion FRET for Multiplexed Sensing and Optical Barcoding 60
Micropores-HIP – Modeling of annihilation of micropores in single-crystal nickel-base superalloys during hot isostatic pressing 61
ICENAP – Integrated Computational Engineering, Characterization and Validation of Semiconductor Colloidal Nanocrystals with Advanced Properties 62

COST (European Cooperation in Science and Technology) **63**
COST-Actions – Collaborative projects 64
Quantifying the value of structural health monitoring 65
Towards the next generation of standards for service life of cement-based materials and structures 66
MINEA – Mining the European Anthroposphere 67

INTRODUCTION

Research, development, innovation and value creation processes are all strongly influenced by global competition, enhanced interconnectedness and digitalization. As a senior scientific and technical Federal institute with responsibility to the Federal Ministry for Economic Affairs and Energy, BAM performs research and development within this global context. Therefore, internationalization is crucial for BAM to fulfill its mission of "Safety in technology and chemistry". This takes place on many levels: research projects with partners, international co-publications, involvement in committees and networks and international exchange of scientists. The latter is also supported through BAM´s guest scientist program and the Adolf-Martens-Fellowships.

A central element of BAM´s internationalization strategy is the participation in European research funding programs. Participation in EU projects contributes substantially to BAM´s overarching strategic objectives of visibility, interdisciplinarity, networking and attractive working conditions. It enables BAM to support and develop German industry through research, assessment and consultation.

On the following pages, we provide an overview of ongoing European-funded research projects at BAM. These projects showcase BAM´s research excellence and international collaborations in its five focus areas energy, environment, infrastructure, materials and analytical sciences.

MARIE S.-CURIE ACTIONS

The Marie Skłodowska-Curie Actions (MSCA) support the career development of talented, internationally mobile researchers and aim at enhancing the attractivity of scientific career paths. BAM hosts highly qualified post-doctoral researchers funded through Individual Fellowships (IF) and successfully participates in Innovative Training Networks (ITN). Together with European partner organisations, BAM offers in these networks innovative training to doctoral students embedded into an excellent research program.

Participations in HORIZON 2020

Marie S.-Curie Actions

GLYC IMAGING

2017/04/01 - 2021/03/31

GlycoImaging – Imaging and detection of tumor-associated glycan structures on tumor cells

http://glycoimaging.mau.se/

BAM Contact:
1.9 Chemical and Optical Sensing
Dr. Knut Rurack
Knut.Rurack@bam.de
+49 30 8104 1190

The overall objective of GlycoImaging is to develop novel assays for detection of glycans as biomarkers associated with aggressive and metastatic cancer forms. The assays will be developed for biomarker detection in blood, urine, cells and tissue. Molecularly Imprinted Polymers (MIPs), or plastic antibodies, have been developed for targeting the human glycan sialic acid (SA), or Neu5Ac. The efficiency of the Neu5Ac specific SAMIPs targeted to the biomarker SA in different solvents (methanol, water, phosphate buffer) will be exploited. The non-human Neu5Gc, which is incorporated into human glycoconjugates through dietary sources such as red meat, and shown to be involved in malignant cell transformation in humans, will also be investigated by using highly specific Neu5Gc-SAMIPs. The imaging and detection techniques used will be based on fluorescence, 3D-viewing of cancer cells by digital holographic microscopy and magnetic separation columns.

The results in this research consortium will lead to major technological advances having impact on 1) health care, since it will develop more accurate and reliable diagnostics of aggressive and metastatic cancers, 2) drug discovery allowing a faster and cheaper biomarker targeting and detection; and 3) biochemistry research laboratories in resulting in improved understanding of glycan expression in cancer, with emphasis on aggressive metastatic cancer. The training of researchers will be performed by a consortium consisting of 6 partners with biomedical, imaging and particle synthesis skills (4 groups, one institution, one technology company). This forms the basis for a very competent interdisciplinary training program with high quality in both education and research.

Coordinator

Malmö University (www.mah.se)

Participants

6

Countries

Sweden, Denmark, Germany, Finland

Total EC Contribution

€ 2.138.720

Funding Scheme

MSCA-ITN-European Training Networks

Total Duration

48 Months

BIOCAPTURE

2016/11/01 - 2020/10/30

BioCapture – Smart capture phases for proteomics, glycomics and biomarker assays

http://biocapture.mau.se/

BAM Contact:
1.9 Chemical and Optical Sensing
Dr. Knut Rurack
Knut.Rurack@bam.de
+49 30 8104 1190

The overall objective of BioCapture is to develop novel robust assays for proteinaceous biomarkers associated with cancer and to develop innovative tools for assaying elusive cancer related posttranslational modifications in proteins. This will be achieved by exploiting robust glycan, peptide and protein binders in the form of Molecularly Imprinted Polymers (MIPs) or plastic antibodies alongside generic enrichment combined with selected reaction monitoring-based mass spectrometry assays. In addition, sequence specific MIPs for multiple proteotypic peptides will be developed for use as capture phases in array format followed by MS or fluorescence based readout as well as a coupling of both detection techniques. The artificial receptors will be developed by various Molecular Imprinting techniques. The research results will lead to technological advances having a major impact on 1) health care since it will profit from methods for earlier, more reliable diagnosis of diseases, 2) drug discovery allowing a faster target or biomarker identification; and 3) biochemistry research laboratories in resulting in improved protein fractionation tools for revealing low abundant post translational modifications. The training of researchers will be performed by a consortium consisting of in Total 15 partners whereof 6 polymer/materials research groups, 5 protein/glycan chemistry/analysis groups, 1 separation technology companies, 2 expert groups on platforms for multiplex analysis and one diagnostic company. This forms the basis for a very exciting interdisciplinary training program. Thus 11 early stage researchers (ESRs) working on specific tasks within five work packages will follow a rich training program providing a well-balanced spectrum of scientific, business and entrepreneurial skills.

Coordinator

Malmö University (www.mah.se)

Participants

8

Countries

Sweden, Denmark, Germany, Norway, United Kingdom

Total EC Contribution

€ 2.982.879

Funding Scheme

MSCA-ITN-European Training Networks

Total Duration

48 Months

2016/05/01 - 2020/04/30

INFRASTAR – Innovation and Networking for Fatigue and Reliability Analysis of Structures – Training for Assessment of Risk

http://infrastar.eu/

BAM Contact:
8.2 Non-Destructive Damage Assessment and Environmental Measurement Methods
Dr. Ernst Niederleithinger
Ernst.Niederleithinger@bam.de
+49 30 8104 1440

INFRASTAR aims to develop knowledge, expertise and skill for optimal and reliable management of structures. The generic methodology will be applied to bridges and wind turbines in relation to fatigue offering the opportunity to deal with complementary notions (such as old and new asset management, unique and similar structures, wind and traffic actions) while addressing 3 major challenges: 1/advanced modelling of concrete fatigue behaviour, 2/new non destructive testing methods for early aged damage detection and 3/probabilistic approach of structure reliability under fatigue. Benefit of cross-experience and interdisciplinary synergies will create new knowledge. INFRASTAR proposes innovative solutions for civil infrastructure asset management so that young scientists will acquire a high employment profile in close dialogue between industry and academic partners.

Modern engineering methods, including probabilistic approaches, risk and reliability assessment tools, will take into account the effective structural behaviour of existing bridges and wind turbines by exploiting monitored data. Existing methods and current state-of -the art is based on excessive conservatism which produces high costs and hinders sustainability.

INFRASTAR will improve knowledge for optimising the design of new structures, for more realistic verification of structural safety and more accurate prediction of future lifetime of the existing structures. That is a challenge for a sustainable development because it reduces building material and energy consumption as well as CO_2 production.

Within the global framework of optimal infrastructure asset management, INFRASTAR will result in a multi-disciplinary body of knowledge covering generic problems from the design stage process of the new civil infrastructures up to recycling after dismantlement. This approach and the proposed methods and tools are new and will allow a step forward for innovative and effective process.

Coordinator

French Institute of Science and Technology for Transport, Development and Networks (www.ifsttar.fr)

Participants

8

Countries

Denmark, France, Germany, Switzerland, Poland

Total EC Contribution

€ 3.161.113

Funding Scheme

MSCA-ITN-European Training Networks

Total Duration

48 Months

FiBreMoD
Marie Skłodowska-Curie European Training Network

2016/10/01 - 2020/09/30

FiBreMoD – Fibre break models for designing novel composite microstructures and applications

http://fibremodproject.eu/

BAM Contact:
3. Containment Systems for Dangerous Goods
Dr.-Ing. Georg Mair
Georg.Mair@bam.de
+49 30 8104 1324

Limiting the climate change-induced temperature increase to less than 2°C will require strong reductions in greenhouse gas emissions. Lightweight materials and fibre-reinforced composites in particular, are a key enabling technology to achieve this goal. Current composite applications are however strongly over-designed due to a lack of reliable design tools and predictive models for their mechanical properties. Developing, using and applying these models requires interdisciplinary researchers with a strong background in both modelling and experiments, but such researchers are scarce. The 9 beneficiaries and 3 partner organisations in FiBreMoD aim to train 13 such researchers to become multi-talented and interdisciplinary researchers that will be highly coveted in the field of composites. They will be intensively trained by leading experts with world-class facilities and will be supported by a strong industry participation and an extensive international network. The training programme places a strong emphasis on entrepreneurship and innovation skills not only by dedicated workshops but also by the involvement of the researchers in potential commercialisation. This approach will be key to improving the EU's innovation capacity. Simultaneously, the researchers will advance state-of-the-art composite failure models to reach the required levels of accuracy and develop advanced and industry-friendly characterisation techniques for measuring the required input data. The goal will be to enable blind predictions, which means that parameter fitting or tuning of the models is no longer required. These new and unprecedented levels of understanding coupled with improved prediction accuracy will be exploited to (1) design novel microstructures for hybrid, hierarchical and discontinuous fibre composites and (2) increase the usefulness of models in practical composite applications. The developed models will be validated and used to design composite cylinders and automotive parts.

Coordinator

KU Leuven, Belgium (www.kuleuven.be)

Participants

9

Countries

Belgium, United Kingdom,
France, Israel, Germany

Total EC Contribution

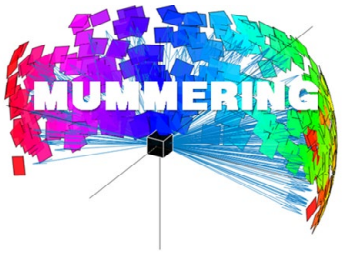
€ 3.370.807

Funding Scheme

MSCA-ITN-European Training Networks

Total Duration

48 Months



2018/01/01 - 2021/12/31

Mummering – MUltiscale, Multimodal and Multidimensional imaging for EngineeRING

http://www.mummering.eu/

BAM Contact:
8.5 Micro Non-Destructive Testing
Prof. Dr./I. Giovanni Bruno
Giovanni.Bruno@bam.de
+49 30 8104 1850

The overarching goal of MUMMERING is to create a research tool that encompasses the wealth of new 3D imaging modalities that are surging forward for applications in materials engineering, and to create a doctoral programme that trains 15 early stage researchers (ESRs) in this tool. This is urgently needed to prevent that massive amounts of valuable tomography data ends on a virtual scrapheap. The challenge of handling and analysing terabytes of 3D data is already limiting the level of scientific insight that is extracted from many data sets. With faster acquisition times and multidimensional modalities, these challenges will soon scale to the petabyte regime. To meet this challenge, we will create an open access, open source platform that transparently and efficiently handles the complete workflow from data acquisition, over reconstruction and segmentation to physical modelling, including temporal models, i.e. 3D "movies". We consider it essential to reach this final step without compromising scientific standards if 3D imaging is to become a pervasive research tool in the visions for Industry 4.0.

The 15 ESRs will be enrolled in an intensive network-wide doctoral training programme that covers all aspects of 3D imaging and will benefit from a varied track of intersectoral secondments that will challenge and broaden their scope and approach to research. The ESRs will exit the MUMMERING network as highly attractive and employable PhDs with a practical and qualified take on industrial research.

Coordinator

Technical University of Denmark (www.dtu.dk)

Participants

11

Countries

Denmark, Belgium, Romania, Germany, Netherlands, France, Switzerland, United Kingdom, Sweden

Total EC Contribution

€ 3.999.114

Funding Scheme

MSCA-ITN-European Training Networks

Total Duration

48 Months

2015/11/01 - 2017/10/31

Nanocytox – Development of Novel Analytical Methods to assess Nanoparticle cytotoxicity

http://cordis.europa.eu/programme/rcn/664546_en.html

BAM Contact:
1. Analytical Chemistry; Reference Materials
Dr. Franziska Emmerling
Franziska.Emmerling@bam.de
+49 30 8104 1133

Nanoparticles , NPs, are being used to produce novel materials with unique physico-chemical properties with many applications in fields such as medicine, energy and electronics, consumer goods, among others. Some studies have revealed that the same specific properties that make NPs so unique could also be responsible for potential harmful effects on the environment and human health. Currently, the assessment of their impact is hampered by limited analytical capabilities to detect them in complex natural matrices. New sensitive and selective analytical methods must be developed and validated in order to elucidate their toxicological effects prior to increasing and promoting the NPs production. Herein, new analytical methodologies based on inductively coupled plasma mass spectrometry (ICP-MS) are proposed to evaluate the toxicity of metallic NPs in cells, one of the most powerful and attractive model systems for toxicological assays. The proposed methodology consists on the use of laser ablation (LA) coupled to ICP-MS for spatially resolved bioimaging of the distribution of NPs in single cells upon different NPs incubation experiments; furthermore, a micro-droplet generator (μDG) for sample introduction of single cells into a sector field ICP-MS will be employed to improve the NPs detection sensitivity. The expected results will give essential insights into nanoparticle/cell interactions and will have implications for the development of analytical methods based on applications of nano-particles for medical diagnostics and therapeutics.

Coordinator

Bundesanstalt für Materialforschung und -prüfung (www.bam.de)

Participants

1

Countries

Germany

Total EC Contribution

€ 159.461

Funding Scheme

MSCA-IF European Fellowship

Total Duration

24 Months

2017/03/01 - 2021/02/28

AMITIE – Additive Manufacturing for Transnational Innovation in Europe

http://www.rise-amitie.eu/

BAM Contact:
5.4 Ceramic Processing and Biomaterials
Prof. Dr. Jens Günster
Jens.Guenster@bam.de
+49 30 8104 1540

Additive manufacturing (AM) technologies and overall numerical fabrication methods have been recognized by stakeholders as the next industrial revolution bringing customers' needs and suppliers' offers closer. It cannot be dissociated to the present trends in increased virtualization, cloud approaches and collaborative developments (i.e. sharing of resources). AM is likely to be one good option paving the way to Europe re-industrialization and increased competitiveness. AMITIE will reinforce European capacities in the AM field applied to ceramic-based products.

Through its extensive programme of transnational and intersectoral secondments, AMITIE will promote fast technology transfer and enable as well training of AM experts from upstream research down to more technical issues. This will provide Europe with specialists of generic skills having a great potential of knowledge-based careers considering present growing needs for AM industry development. To do that, AMITIE brings together leading academic and industrial European players in the fields of materials science/processes, materials characterizations, AM technologies and associated numerical simulations, applied to the fabrication of functional and/or structural ceramic-based materials for energy/transport, and ICTs applications, as well as biomaterials. Those players will develop a new concept of smart factory for the future based on 3D AM technologies (i.e. powder bed methods, robocasting, inkjet printing, stereolithography, etc.) and their possible hybridization together or with subtractive technologies (e.g. laser machining). It will allow for the production of parts whose dimensions, shapes, functionality and assembly strategies may be tailored to address today's key technological issues of the fabrication of high added value objects following a fully-combinatorial route. This is expected to lead to a new paradigm for production of multiscale, multimaterial and multifunctional components and systems.

Coordinator

University of Limoges (www.unilim.fr)

Participants

17

Countries

France, Italy, Spain, Germany, United Kingdom, Belgium

Total EC Contribution

€ 877.500

Funding Scheme

MSCA-RISE – Research and Innovation Staff Exchange

Total Duration

48 Months

Participations in FP7

Marie S.-Curie Actions

2014/03/01 - 2018/02/28

IsoNose – Isotopic Tools as Novel Sensors of Earth Surface Resources

http://www.isonose.eu

BAM Contact:
4. Materials and the Environment
Prof. Dr. Anna Gorbushina
Anna.Gorbushina@bam.de
+49 30 8104 1400

Soil, water, and precious metals are major natural resources present at the Earth´s terrestrial surface and their efficient management is essential for future sustainable development. Their availability is regulated by massive biogeochemical transformations that take place as the chemical elements move from rock to soil, into plants, through ground water, into river water, and into ore deposits. These precious resources are currently being exploited to an extent that is unprecedented in the history of our planet. We will make use of recent technological advances, in the form of novel mass-spectrometric methods, that have the as-yet unrealised capacity to make fundamental advances in understanding the formation of these resources. The understanding developed with these new tools will ultimately guide the sustainable exploitation of Earth surface environments. We will train young researchers in these ISOtopic tools as NOvel Sensors of Earth surface resources (IsoNose) through this European Initial Training Network. Long-term collaboration to train this new generation of scientists will be initiated by instrument manufacturers, academic specialists in method development and applications, private sector participants from the environmental, material certification, and metal ore resources fields. The researchers will use IsoNose as a platform to lead this emerging field into new areas, including the geosciences, environmental forensics, biomedical sciences, and mineral resource prospecting.

Coordinator

Helmholtz Centre Potsdam GFZ German Research Centre for Geosciences (www.gfz-potsdam.de)

Participants

8

Countries

Germany, United Kingdom, Ireland, France

Total EC Contribution

€ 3.818.939

Funding Scheme

MC Initial Training Network (ITN)

Total Duration

48 Months

2013/10/01 - 2017/09/30

TRIPOD – Triple Energy saving by use of CRP, CLT and podded propulsion

www.tripod-itn.eu

BAM Contact:
8.6 Fibre Optic Sensors
Dr.-Ing. Katarina Krebber
Katarina.Krebber@bam.de
+49 30 8104 1915

The project is located in the field of optical fibre sensors – an area where Europe has developed internationally competitive research and commercial activity. The aim is to significantly extend the range of application of optical fibre grating sensors by developing a mature version of the technology in polymer optical fibres and thereby increase European competitiveness.

Polymer fibres offer some key advantages over silica, the two most important perhaps being the ability to sense much higher strains and the considerably reduced stiffness of the plastic compared to the glass fibre. Polymers are however complex materials and the properties of a sensor in this material are dependent on all stages of the sensor fabrication process, from initial preform production, through fibre drawing to grating fabrication.

In TRIPOD we have brought together an interdisciplinary scientific team with expertise covering all aspects of the sensor fabrication path to enable us to obtain a full understanding of the process, with the aim of enabling us to produce optimised grating sensors, efficiently, repeatably and reliably. Integral to the programme are end-user companies who will provide direction on sensor development and training to the researchers on business issues, as well as familiarising themselves with the new technology, enabling them to expand their business models. In addition, we include technology innovators to open up further applications and potential markets.

Coordinator

Aston University (www.aston.ac.uk)

Participants

8

Countries

United Kingdom, Denmark, Poland, Cyprus, Spain, Germany

Total EC Contribution

€ 3.089.229

Funding Scheme

MC Initial Training Network (ITN)

Total Duration

48 Months

HORIZON 2020/FP7 COLLABORATIVE PROJECTS

Collaborative projects with several European and international partners are the backbone of European research and innovation. BAM collaborates in the following projects with partners from academia and industry.

Participations in Horizon 2020

Collaborative projects

2015/07/01 - 2018/06/30

LiNaBioFluid – Laser-induced Nanostructures as Biomimetic Model of Fluid Transport in the Integument of Animals

http://www.laserbiofluid.eu/

BAM Contact:
6.4 Nanomaterial Technologies
Dr. Jörn Bonse
Joern.Bonse@bam.de
+49 30 8104 3562

The integument of an animal body has various functions, which are often achieved by specific micro- and/or nano- hierarchical structures. Examples are the very low water friction and air retention of water spiders or the swim fern of salvinia and the outstanding adhesion properties of geckos. In this project, we will employ advanced laser-processing strategies based on self-organization, to mimic the specific topography and the excellent wetting properties of the integument of bark bugs and moisture harvesting lizards resulting from adaptations to their environment. Flat bark bugs darken during rain fall due to a super-wettable body surface with capillaries out of which water spreads onto plain areas of the bug. For moisture harvesting in lizards wettability takes place in opposed direction, i.e. from plain areas into a capillary network on the skin. A fast and directional transport results from a special geometry of capillaries. Thus as general objective we want to test whether both effects, i.e. fast capillary transport (lizard) and liquid spreading onto plain areas (bark bugs), can be combined by optimized structures with hierarchical geometry. The outcome of this innovative biomimetic exploitation of wetting effects is expected to lead to a radically new technological approach of laser-generated surface textures on micro- and nanometer scale. Especially for control of friction and wear in liquids, leveraging new results can be expected, e.g. for developing slide bearings. The extension of surface structures over large areas is feasible. Thus, laser-fabrication of biomimetic surfaces with extreme wetting properties can be also anticipated in further applications, e.g. lubrication, water and oil separation, reduced drag in underwater applications, high power device cooling. All related to an innovative and sustainable reduction of CO2 emission.

Coordinator

Foundation for Research and Technology Hellas (www.forth.gr)

Participants

7

Countries

Germany, Austria, Greece, Spain

Total EC Contribution

€ 3.024.827

Funding Scheme

FET OPEN, Research and Innovation Action (RIA)

Total Duration

36 Months

2015/05/01 - 2018/04/30

HERCULES-2 – Fuel flexible, near-Zero emission, adaptive performance marine engine

http://www.hercules-2.com/

BAM Contact:
5.2 Experimental and Model Based Mechanical Behaviour of Materials
Prof. Dr.-Ing. Birgit Skrotzki
Birgit.Skrotzki@bam.de
+49 30 8104 1520

The project HERCULES-2 is targeting at a fuel-flexible large marine engine, optimally adaptive to its operating environment.

The objectives of the HERCULES-2 project are associated to 4 areas of engine integrated R&D:
- Improving fuel flexibility for seamless switching between different fuel types, including non-conventional fuels.
- Formulating new materials to support high temperature component applications.
- Developing adaptive control methodologies to retain performance over the powerplant lifetime.
- Achieving near-zero emissions, via combined integrated aftertreatment of exhaust gases.

The HERCULES-2 is the next phase of the R&D programme HERCULES on large engine technologies, which was initiated in 2004 as a joint vision by the two major European engine manufacturer groups MAN and WARTSILA. Three consecutive projects namely HERCULES – A, -B, -C spanned the years 2004-2014. These three projects produced exceptional results and received worldwide acclaim.

The targets of HERCULES-2 build upon and surpass the targets of the previous HERCULES projects, going beyond the limits set by the regulatory authorities. By combining cutting-edge technologies, the Project overall aims at significant fuel consumption and emission reduction targets using integrated solutions, which can quickly mature into commercially available products. Focusing on the applications, the project includes several full-scale prototypes and shipboard demonstrators.

The project HERCULES-2 comprises 4 R&D Work Package Groups (WPG):
- WPG I: Fuel flexible engine
- WPG II: New Materials (Applications in engines)
- WPG III: Adaptive Powerplant for Lifetime Performance

Coordinator

National Technical University of Athens (www.ntua.gr)

Participants

33

Countries

Germany, Finland, Greece, Denmark, Italy, United Kingdom, Sweden, Spain, Austria, Netherlands, Switzerland

Total EC Contribution

€ 16.813.400

Funding Scheme

Societal Challenge 4 "Smart, Green and Integrated Transport", Research and Innovation Action (RIA)

Total Duration

36 Months

2015/01/01 - 2017/12/31

CONSENS – Integrated Control and Sensing for sustainable Operation of Flexible Intensified Processes

http://www.consens-spire.eu/

BAM Contact:
1.4 Process Analytical Technology
Dr. Michael Maiwald
Michael.Maiwald@bam.de
+49 30 8104 1140

Intensified continuous processes are a key innovation of the last decade for the production of high quality, high value and customer-specific products at competitive prices in a sustainable fashion. To realize the potential of this technology, key steps must be made towards long-term stable, tightly controlled and fully automated production. The goal of the CONSENS project is to advance the continuous production of high-value products meeting high quality demands in flexible intensified continuous plants by introducing novel online sensing equipment and closed-loop control of the key product parameters. CONSENS will focus on flexible continuous plants but the results will be transferable also to large-scale continuous processes.

The research and development is driven by industrial case studies from three different areas, spanning the complete value chain of chemical production: complex organic synthesis, speciality polymers, and formulation of complex liquids.

Coordinator

BAYER AG (www.bayer.de)

Participants

15

Countries

Germany, France, Netherlands, Belgium, Italy

Total EC Contribution

€ 5.997.550

Funding Scheme

LEIT Nanotechnology, Materials, Biotechnology, Production (NMBP, PPP SPIRE), Research and Innovation Action (RIA)

Total Duration

36 Months

ACEnano
Analytical and Characterisation Excellence

2017/01/01 - 2020/12/31

ACEnano – Analytical and Characterisation Excellence in nanomaterial risk assessment

www.acenano-project.eu

BAM Contact:
6.1 Surface Analysis and Interfacial Chemistry
Dr.-Ing. Wolfgang Unger
Wolfgang.Unger@bam.de
+49 30 8104 1823

An increasing number of nanomaterials (NMs) are entering the market in every day products spanning from health care and leisure to electronics, cosmetics and foodstuff. Nanotechnology is a truly enabling technology, with unlimited potential for innovation. However, the novelty in properties and forms of NMs makes the development of a well-founded and robust legislative framework to ensure safe development of nano-enabled products particularly challenging. At the heart of the challenge lies the difficulty in the reliable and reproducible characterisation of NMs given their extreme diversity and dynamic nature, particularly in complex environments, such as within different biological, environmental and technological compartments. Two key steps can resolve this: 1) the development of a holistic framework for reproducible NM characterisation, spanning from initial needs assessment through method selection to data interpretation and storage; and 2) the embedding of this framework in an operational, linked-up ontological regime to allow identification of causal relationships between NMs properties, be they intrinsic, extrinsic or calculated, and biological, (eco)toxicological and health impacts fully embedded in a mechanistic risk assessment framework. ACEnano was conceived in response to the NMBP 26 call with the aim to comprehensively address these two steps. More specifically ACEnano will introduce confidence, adaptability and clarity into NM risk assessment by developing a widely implementable and robust tiered approach to NM physico-chemical characterisation that will simplify and facilitate contextual (hazard or exposure) description and its transcription into a reliable NMs grouping framework. This will be achieved by the creation of a conceptual "toolbox" that will facilitate decision-making in choice of techniques and SOPs, linked to a characterisation ontology framework for grouping and risk assessment and a supporting data management system.

Coordinator

The University of Birmingham (www.bham.ac.uk)

Participants

26

Countries

United Kingdom, Germany, Sweden, Austria, Netherlands, Belgium, Korea, China, Switzerland

Total EC Contribution

€ 7.000.000

Funding Scheme

LEIT, Nanotechnology, Materials, Biotechnology, Production (NMBP), Research and Innovation Action (RIA)

Total Duration

48 Months

2016/12/01 - 2020/11/30

SCALE – Production of Scandium compounds and Scandium Aluminium alloys from European metallurgical by products

http://scale-project.eu/

BAM Contact:
4.4 Thermochemical Residues Treatment and Resource Recovery
Dr.-Ing. Christian Adam
Christian.Adam@bam.de
+49 30 8104 5670

Scandium (Sc) is one of the highest valued elements in the periodic table and an element which is usually grouped in REEs as it shares many characteristics with Yttrium. Scandium technological applications are unique, as it is a key component in producing Solid Oxide Fuel Cells (Scandia-Stabilized-Zirconia solid electrolyte layer) or high strength Aluminum alloys used in aerospace and 3D printing applications (SCALMALLOY®). Yet Scandium supply is limited due to its scarcity and the high cost of its production, which currently takes place in Asia and Russia.

Europe has no production of Scandium, but is home to many Sc industrial end-users (Airbus, II-VI, KBM Affilips and others). In fact end-users like Airbus, are not deploying their Sc applications due to the lack of a secure Sc supply. The SCALE project sets about to develop and secure a European Sc supply chain through the development of technological innovations which will allow the extraction of Sc from European industrial residues.

Bauxite Residues from alumina production (5 Million tons on dry basis per year in Europe) and acid wastes from TiO2 pigment production (1.4 Million tons on dry basis per year in Europe) have Sc concentrations which are considered exploitable, given a viable extraction technology. SCALE develops and demonstrates the value chain starting from residue and finishing to high tech end-product. In more detail:

- SCALE develops innovative technologies that can extract economically and sustainably Sc from dilute mediums (<100 mg/L) and upgrade them to pure oxides, metals and alloys at lower energy or material cost.
- SCALE extracts along with Sc all other REEs found in the by-products (AoG's BR on an annual base contain 10% of the European REE raw material imports)

The industrially driven SCALE consortium covers the entire Sc value chain with 7 major European industries and further features 8 academic and research institutes and 4 engineering companies with track records in RTD.

Coordinator

Aluminium of Greece (www.alhellas.gr)

Participants

19

Countries

Germany, Greece, Cyprus, Norway, Sweden, Netherlands, Luxembourg, Hungary, United Kingdom, Switzerland

Total EC Contribution

€ 7.000.000

Funding Scheme

Societal Challenge 5 "Climate Action, Environment, Resource Efficiency and Raw Materials", Research and Innovation Action (RIA)

Total Duration

48 Months

2016/11/01 - 2019/10/31

EC4SafeNano – European Centre for Risk Management and Safe Innovation in Nanomaterial Nanotechnologies

www.ec4safenano.eu

BAM Contact:
6.1 Surface Analysis and Interfacial Chemistry
Dr.-Ing. Wolfgang Unger
Wolfgang.Unger@bam.de
+49 30 8104 1823

A significant challenge to ensuring sustainable production and use of nanotechnologies is to understand safety and health risks of the technology and its end-products, and to implement practical strategies to manage these risks. Knowledge is growing rapidly, but effective use of this knowledge for risk management is lagging behind. We therefore need to bridge the gap between knowledge on hazard and risk, and 'fit-for-purpose' risk management tools and strategies supported by measurement and control methods.

EC4SafeNano will bridge this gap in an efficient and sustainable way by setting up an independent, science-based, managed Centre (hub) linked with several networks (spokes) to act at the interface between research organisations, industry, regulatory bodies, and civil society.

The objectives are to: 1) understand the needs of all stakeholders along the innovation value chain for nanotechnologies, ensuring safer, marketable, regulated and accepted long-lived products; 2) identify the resources and capabilities available to address these needs, and evaluate the capacity to provide technical solutions and actions; 3) build, test and benchmark a range of services, based on selected resources that answer stakeholder needs across the innovation value chain; 4) develop mechanisms and operating procedures to facilitate periodic updating of the "needs and resources" mapping and of the service provision; 5) develop networking activities aiming to share, benchmark and promote the EC4SafeNano services thereby enhancing and harmonizing the overall expertise, at EU level and beyond; and 6) develop governance rules and a strategic plan to prepare for self-sufficient operation beyond the project lifetime.

The main outcome is the definition of a legal entity with operating procedures, gathering, integrating and sharing available technology, tools, skills and processes and promoting services and capabilities to support stakeholder needs in risk management and safe innovation.

Coordinator

French National Institute for Industrial Environment and Risks INERIS (www.ineris.fr)

Participants

15

Countries

France, Germany, Belgium, Spain, Sweden, United Kingdom, Netherlands, Finland, Greece, Denmark, Austria, Italy

Total EC Contribution

€ 1.999.013

Funding Scheme

LEIT, Nanotechnology, Materials, Biotechnology, Production (NMBP), Coordination and Support Action (CSA)

Total Duration

36 Months

TANK HYDROGEN AUTOMOTIVE

2018/01/01 - 2020/12/31

TAHYA – TAnk HYdrogen Automotive

www.tahya.eu

BAM Contact:
3. Containment Systems for Dangerous Goods
Dr.-Ing. Georg Mair
Georg.Mair@bam.de
+49 30 8104 1324

While automakers have demonstrated progress with prototypes and commercial vehicles traveling greater than 500 km on a single fill, this driving range must be achievable across different vehicle makes and models and without compromising customer expectations of space, performance, safety, or cost.

The TAHYA project, mainly led by industrial partners -already involved in producing and manufacturing hydrogen solutions for the automotive and aviation industry-, will focus on the development of a complete, competitive and innovative European H2 storage system (a cylinder with a mounted On-Tank-Valve with all integrated functionalities) for automotive applications up-performing the actual Asian and US ones.

The TAHYA consortium composed of Optimum CPV, Anleg, Raigi, Volkswagen, Chemnitz University of Technology, Bundesanstalt für Materialforschung und -prüfung, PolarixParner and Absiskey will ensure that the development phase of the storage system remain in line with the expectations (cost, performance and safety) required by the market, end users' and car manufacturers.

The key objectives of the TAHYA project are:

- Preparatory work to provide a compatible H2 storage system with high performances, safe and Health Safety Environment responsible.
- Provide a compatible H2 storage system with mass production and cost competitive.
- Regulation Codes and Standards (RCS) activities to propose updates on GRT13 and EC79 according to tests results obtained over the duration of the project.

Coordinator

OPTIMUM CPV (www.plasticomnium.com/en)

Participants

8

Countries

Belgium, Germany, France

Total EC Contribution

€ 721.218,75

Funding Scheme

Fuel Cells and Hydrogen Joint Undertaking (FCH JU), Research and Innovation action (RIA)

Total Duration

36 Months

2018/07/01 - 2019/12/31

CellFreeImplant – Cell-free Ti-based Medical Implants due to Laser-induced Microstructures

https://cordis.europa.eu/project/rcn/214393_en.html

BAM Contact:
6.4 Nanomaterial Technologies
Dr. Jörn Bonse
Joern.Bonse@bam.de
+49 30 8104 3562

New miniaturized and smart medical implants are more and more used in all medical fields, including miniaturized pacemakers. These implants with a casing consisting often of a Ti-alloy may have to be removed after some months or several years and shall therefore not be completely overgrown by the cells. In the framework of the ongoing FET Open project LiNaBioFluid, we successfully demonstrated that self-organized sharp cones or spikes at Ti-alloy substrates created by pulsed laser-ablation can result not only in complete wetting by water and body fluids but at the same time provide too little surface for the cells (i.e., fibroblasts) to grow on. Compared to flat surfaces, the cell density on the microstructures is significantly lowered, the coverage is incomplete and the cells have a clearly different morphology. The best results regarding suppression of cell growth are obtained on structures created by femtosecond Ti:sapphire laser irradiation, which are subsequently electrochemically treated. The goal of the Coordination and Support Action CellFreeImplant is to find strategic partners (end-users) for future development of smart medical implants addressing wide-spread patients needs for instance in the field of cardio-vascular diseases. The project activities include the identification of the market segments and needs and assessment of the technology with end-users.

Coordinator

University of Linz (www.jku.at)

Participants

3

Countries

Austria, Germany

Total EC Contribution

€ 100.000

Funding Scheme

FET-Open, Coordination and Support Action (CSA)

Total Duration

18 Months

Participations in FP7

Collaborative projects

2014/10/01 - 2018/09/30

Best Paths – Beyond State-Of-The-Art Technologies For Power Ac Corridors And Multi-Terminal Hvdc Systems

http://www.bestpaths-project.eu/

BAM Contact:
7. Safety of Structures
Dr.-Ing. Andreas Rogge
Andreas.Rogge@bam.de
+49 30 8104 1190

A group of eight Transmission System Operators with a generator company, manufacturers and research organisations, propose 5 demonstration projects to remove, in 4 years, several barriers which prevent large-scale penetration of renewable electricity production in the European transmission network. The full scale demonstrations led by industry aim at proving the benefits of novel technologies coupled with innovative system integration approaches:

- A scaled down model of generators connected to a HVDC link is used within a new testing facility to validate novel control strategies to improve the interaction between HVDC links and wind turbine generators
- The implementation of a full scale, hardware-in-the-loop test setup in collaboration with worldwide market leaders of HVDC-VSC technology explores the interactions of HVDC VSC multiterminal control systems to validate their interoperable operations
- Strategies to upgrade existing HVDC interconnectors are validated with the help of innovative components, architecture and system integration performances, to ensure higher RES penetration and more efficient cross border exchanges.
- Full scale experiments and pilot projects at real life scale of both installation and operation of AC overhead line repowering technologies are carried out to show how existing corridors can see their existing capacity increase within affordable investments.
- The technical feasibility of integrating DC superconducting links within an AC meshed network (using MgB2 as the critical material) will be tested at prototype scale, thus proving that significant performance improvements have been reached to enable commercialization before 2030

The experimental results will be integrated into European impact analyses to show the scalability of the solutions: routes for replication will be provided with benefits for the pan European transmission network and the European electricity market as soon as 2018, in line with the SET plan objectives.

Coordinator

Red Electrica de Espana (www.ree.es)

Participants

37

Countries

Belgium, Germany, Italy, France, Norway, Hungary, Denmark, United Kingdom, Sweden, Spain

Total EC Contribution

€ 35.499.975

Funding Scheme

Energy, Collaborative project

Total Duration

48 Months

2013/11/01 - 2017/10/31

NANOMAG – Nanometrology Standardization Methods for Magnetic Nanoparticles

http://www.nanomag-project.eu/

BAM Contact:
6.5 Polymers in Life Sciences and Nanotechnology
Dr. Andreas Thünemann
Andreas.Thuenemann@bam.de
+49 30 8104 1610

The NanoMag project is to improve and redefine existing analyzing methods and in some cases, to develop new analyzing methods for magnetic nanostructures. Using improved manufacturing technologies we will synthesize magnetic nanoparticles with specific properties that will be analyzed with a multitude of characterization techniques (focusing on both structural as well as magnetic properties) and bring the experimental results together to obtain a self-consistent picture which describes how structural and magnetic properties are interrelated. This extensive survey will be used to define standard measurements and techniques which are necessary for defining a magnetic nanostructure and quality control. NanoMag brings together Europe's and internationally leading experts in; manufacturing of magnetic single-core nanoparticles and magnetic multi-core particles, analyzing and characterization of magnetic nanostructures and national metrology institutes. In the consortium we have gathered partners within research institutes, universities and metrology institutes, all carrying out front end research and developing applications in the field of magnetic nanoparticles.

Coordinator

RISE ACREO AB (www.acreo.se)

Participants

37

Countries

Germany, Denmark, United Kingdom, Sweden, Netherlands, Spain

Total EC Contribution

€ 8.841.930

Funding Scheme

NMP, Collaborative project (Large-scale integrating project)

Total Duration

48 Months

[H]house

2013/09/01 - 2017/08/31

H-House – Healthier Life with Eco innovative Components for Housing Constructions

http://www.h-house-project.eu/

BAM Contact:
7.1 Building Materials
Dr. Birgit Meng
Birgit.Meng@bam.de
+49 30 8104 71710

H-House is aiming at the development of a number of building components for modern society where awareness for environmental aspects and living comfort are not compromised but complementing each other. The concept of H-House aims at components for the building envelope and components for the interior applied to both new buildings and for renovation. The purpose of an adequate building envelope is protection against moisture ingress, heat loss in winter, excessive heating in summer and noise. Components for the interior should be able to buffer heat and humidity peaks and prevent pollutants and noise. Solutions for both components for building envelope and components for the interior have to be durable, energy-efficient and affordable. Therefore, H-House will propose innovative sustainable façade and partition walls based on earthen materials, optimised cementitious materials with modified surfaces and wooden/cellulose materials. An innovative modification of the listed materials with additions of energy-saving and air purifying aerogel granulates will create optimal conditions for living. The concept of H-House covers chemical and physical 'activity' of the developed building materials, their embodied energy, suitability in different environments, durability, cost-efficiency and long-term improvement of energy efficiency of buildings. The complementary consortium has a strong industrial dominance (9 partners) and 3 research institutes.

Coordinator

Rise CBI Betonginstitutet (www.cbi.se)

Participants

12

Countries

Sweden, Germany, Poland, France

Total EC Contribution

€ 4.749.762

Funding Scheme

NMP (PPP Energy Efficient Buildings),
Collaborative project (Large-scale integrating project)

Total Duration

48 Months

2013/09/01 - 2017/06/30

BRIMEE – Cost effective and sustainable bio-renewable indoor materials with high potential customization and creative design in energy efficient buildings

http://www.brimee.eu/

BAM Contact:
4.2 Materials and Air Pollutants
Dr.-Ing. Oliver Jann
Oliver.Jann@bam.de
+49 30 8104 1420

The challenge of today lies in the accomplishment of sustainable and low-energy buildings, which can combine at the same time the thermal insulation properties with healthy, comfortable, accessible and safe indoor environment. Reduction of the energy demand through the use of insulating materials still remains a challenge for European architects and building designers as well as materials producers. Beside good and consistent thermal and acoustic performance overtime, a good and marketable insulation material should in fact be self-extinguishing, not degradable, unshrinkable or non-settling, safe during handling and installation, low cost and should not pollute the indoor building environment, while having a low embodied energy, proven through LCA assessment. The main aim of the BRIMEE project is therefore to combine the development of better performing insulation materials for improving buildings energy performance and having as final overall objective a significant reduction of buildings operational energy, in combination with the capability not to emit harmful substances and to act as an absorber for indoor pollutants. Our innovation is based on a Nano-Cristalline Cellulose (NCC) based foam, strengthened with Natural derived resin (furan), providing self extinguishing features. An enzimatic approach and protein fusion to the Cellulose basis is exploited to confer to the material additional functionalities from the bulk, such as fragrance release, water repellence or anti-bacteria. Thanks to an advanced processing, the NCC material can be profitably extracted from the waste streams of the pulp and paper industry. Although the BRIMEE product family is applicable for the envelope and interior partitions of both new and existing buildings, most of the impact and the largest market is represented by buildings built before 1975 and requiring retrofitting. This is the initial market to be penetrated in line with EU priorities and recent action plans and directives.

Coordinator

Rina Consulting-D'Appolonia (www.rina.org)

Participants

15

Countries

Italy, Spain, Poland, United Kingdom, Israel, Slovenia, Greece, Czech Republic, Romania

Total EC Contribution

€ 4.000.000

Funding Scheme

NMP (PPP Energy Efficient Buildings), Collaborative project (Large-scale integrating project)

Total Duration

48 Months

2013/11/01 - 2017/10/31

NANO DEFINE – Development of an integrated approach based on validated and standardized methods to support the implementation of the EC recommendations for a definition of nanomaterial

http://www.nanodefine.eu/

BAM Contact:
6.1 Surface Analysis and Interfacial Chemistry
Dr.-Ing. Vasile-Dan Hodoroaba
Dan.Hodoroaba@bam.de
+49 30 8104 3144

Nanotechnology is a key enabling technology. Still existing uncertainties concerning EHS need to be addressed to explore the full potential of this new technology. One challenge consists in the development of methods that reliably identify, characterize and quantify nanomaterials (NM) both as substance and in various products and matrices. The European Commission has recently recommended a definition of NM as reference to determine whether an unknown material can be considered as ‚nanomaterial' (2011/696/EU). The proposed NanoDefine project will explicitly address this question. A consortium of European top RTD performers, metrology institutes and nanomaterials and instrument manufacturers has been established to mobilize the critical mass of expertise required to support the implementation of the definition. Based on a comprehensive evaluation of existing methodologies and a rigorous intra-lab and inter-lab comparison, validated measurement methods and instruments will be developed that are robust, readily implementable, cost-effective and capable to reliably measure the size of particles in the range of 1–100 nm, with different shapes, coatings and for the widest possible range of materials, in various complex media and products. Case studies will assess their applicability for various sectors, including food/feed, cosmetics etc. One major outcome of the project will be the establishment of an integrated tiered approach including validated rapid screening methods (tier 1) and validated in depth methods (tier 2), with a user manual to guide end-users, such as manufacturers, regulatory bodies and contract laboratories, to implement the developed methodology. NanoDefine will be strongly linked to main standardization bodies, such as CEN, ISO and OECD, by actively participating in TCs and WGs, and by proposing specific ISO/CEN work items, to integrate the developed and validated methodology into the current standardization work.

Coordinator

Wageningen University & Research (www.wur.nl)

Participants

29

Countries

Germany, Denmark, Austria, Netherlands, France, Switzerland, Belgium, United Kingdom, Italy, Spain, Sweden

Total EC Contribution

€ 6.999.283

Funding Scheme

NMP, Collaborative project
(Large-scale integrating project)

Total Duration

48 Months

EMPIR

In 2009, the European Council and the European Parliament established the „European Metrology Research Programme“ (EMRP) to bring together research activities and resources of European metrology institutes. Its successor program is the „European Metrology Programm for Innovation and Research“ (EMPIR), implemented by the European Association of National Metrology Institutes (EURAMET).

EMPIR participations

Collaborative projects

2018/05/01 - 2021/04/30

nPSize – Improved Traceability Chain of nanoparticle Size Measurements

https://netzwerke.bam.de/Netzwerke/Navigation/EN/Projects/NPSIZE/npsize.html

BAM Contact:
6.1 Surface Analysis and Interfacial Chemistry
Dr.-Ing. Vasile-Dan Hodoroaba
Dan.Hodoroaba@bam.de
+49 30 8104 3144

Nanomaterials and nanoparticles are finding applications across a wide range of technology sectors, from medicine and food to transportation and construction. In order to assess these new materials for potential risks to health and the environment, they need to be well-characterised: from the range of measurements possible, constituent nanoparticle size, shape, and size distribution are important factors for the risk evaluation process.

This project will assess a range of nanoparticle measurement systems, including Scanning Electron Microscopy and Small Angle X-ray Scattering, and deliver to users improved calibration methods. For the techniques under investigation, physical models of their response to a range of nanoparticle types will be developed; validated reference materials will also be used for an inter-comparison of measurement systems, with an evaluation of associated measurement accuracies. With project contributions to standards development work, manufacturers will be better placed to assess the human and environmental risks posed by nanomaterials across a whole range of products.

Coordinator

Dr.-Ing. Vasile-Dan Hodoroaba, BAM (www.bam.de)

Participants

10

Countries

Germany, Netherlands, Belgium, France, United Kingdom

Funding Scheme

Joint Research Project

Total Duration

36 Months

2018/06/01 - 2021/05/31

MicroProbes – Multifunctional ultrafast microprobes for on-the-machine measurements

https://www.euramet.org/

BAM Contact:
6.3 Macrotribology and Wear Protection
Dr. Brunero Cappella
Brunero.Cappella@bam.de
+49 30 8104 3548

For the production of materials and coatings used in modern technology, surface quality monitoring is key: high-value manufacturing requires accurate measurement of properties such as roughness, elasticity or contamination. As the demand for precision increases, tactile microprobes used to inspect components will need better characterisation. Furthermore, existing optical inspection techniques are inadequate for in-line use; microprobe-based systems, however, could be integrated into the production line to achieve fast and continuous quality control.

This project will develop tactile microprobes and their industrial use for material surface measurements. Probe tips will be developed for improved wear resistance and have their geometries characterised for better accuracy in various modes of use. By integrating such devices into the manufacturing process, in-line product inspection could be 30 times faster compared to off-line methods; production-line efficiency and waste reduction through improved quality control therefore delivers direct economic and environmental benefits. Industry users will also gain from the project results through good practice guides and training events.

Coordinator

Physikalisch-Technische Bundesanstalt (www.ptb.de)

Participants

12

Countries

Germany, Czech Republic, Finland, United Kingdom

Funding scheme

Joint Research Project

Total Duration

36 Months

2018/06/01 - 2021/05/31

AdvanCT – Advanced Computed Tomography for dimensional and surface measurements in industry

https://www.euramet.org/

BAM Contact:
8.5 Micro Non-Destructive Testing
Dr. Christian Gollwitzer
Christian.Gollwitzer@bam.de
+49 30 8104 4720

Computed tomography (CT) scans are moving out of hospitals and into factories. Advances in the technique mean that it can increasingly be used to measure product dimensions and surface features. While industrial CT measurement remains time consuming and prone to considerable error, it can simultaneously evaluate both the complete inner and outer geometry of a sample without causing it any damage. This could substantially improve product development and quality control, but quicker and more accurate techniques are needed to provide practical CT scanning that can be integrated into production lines.

This project will significantly enhance the quality and efficiency of measurements performed using CT. By correcting geometry errors by 9 degrees of freedom and those originating in the X-ray tube and detector, the project will improve CT accuracy by a factor of 2-8. It will also produce fast CT methods to reduce measurement time to a few minutes or less, greatly benefiting advanced manufacturing in areas such as the automotive, aerospace, and telecoms industries.

Coordinator

Physikalisch-Technische Bundesanstalt (www.ptb.de)

Participants

8

Countries

Germany, Denmark, Croatia, France, Switzerland, Finland, United Kingdom

Funding scheme

Joint Research Project

Total Duration

36 Months

2018/05/01 - 2021/04/30

ESCoShell – An ISO Technical Report on the use of Electron Spectroscopy for Measurement of Core-Shell Nanoparticle Shell Thicknesses

https://www.euramet.org/

BAM Contact:
6.1 Surface Analysis and Interfacial Chemistry
Dr. Wolfgang Unger
Wolfgang.Unger@bam.de
+49 30 8104 1823

Medical diagnostics, solar cells, and catalysis are all industries increasingly making use of the value of coated nanoparticles. The field of nanoparticle drug delivery, for example, set to be worth more than €110 billion by 2022. An important factor of a nanoparticle's usefulness in different situations is the thickness and surface chemistry its coating, and so being able to measure these characteristics accurately is critical to understanding environmental interactions and behaviour.

This project will produce an ISO Technical Report for measuring coating thickness of nanoparticles, using electron spectroscopy. The report will cover a comprehensive set of methods and best practice issues to ensure that nanoparticle characterisation can be performed accurately and consistently between different analysts and instruments. Providing clear guidance towards reliable surface analysis of coatings will give users more confidence in the validity of their measurements, supporting the utilisation of nanoparticles in novel products and applications ranging from cancer diagnostics to sun cream.

Coordinator

National Physical Laboratory (www.npl.co.uk)

Participants

2

Countries

Germany, United Kingdom

Funding scheme

Support for Impact Project

Total Duration

36 Months

2017/09/01 - 2020/08/31

ALCOREF – Certified forensic alcohol reference materials

https://netzwerke.bam.de/Netzwerke/

BAM Contact:
1.8 Environmental Analysis
Dr. Rosemarie Philipp
Rosemarie.Philipp@bam.de
+49 30 8104 5893

More widespread alcohol testing for drivers, especially the Baltics and Southern Europe where alcohol related accidents are high, is seen as a key measure in reducing road deaths. Access to breathalysers of agreed standards across Europe is key to this. To accurately calibrate these breathalysers, there is a need for standardised test gases similar to human breath with defined concentrations of alcohol. Currently, only two European NMIs produce such gases.

The project will build production capabilities for ethanol/water reference materials and analytical methods for quantifying ethanol in water at NMIs/DIs across Europe, allowing them to reproducibly create alcohol reference materials traceable to the SI. Each NMI will develop a strategy for the long-term development of their measurement and production capabilities, aligned with a European wide approach. Wider access to certified reference materials will allow manufacturers of breathalysers to meet common standards and so support better enforcement of drink driving laws across Europe.

Coordinator

Rosemarie Philipp, BAM
(www.bam.de)

Participants

11

Countries

Germany, Spain, Poland, Bosnia and Herzegowina, France, Serbia, Turkey

Funding scheme

Joint Research Project

Total Duration

36 Months

2017/06/01 - 2020/05/31

HyMet – Hybrid metrology for thin films in energy applications

https://www.euramet.org/

BAM Contact:
6.7 Surface Modification and Measurement Technology
Dr. Andreas Hertwig
Andreas.Hertwig@bam.de
+49 30 8104 3515

Two key challenges facing developers of innovative energy technologies are ensuring their long-term durability and accelerating the time-to-market. One area in which both are particularly challenging is the development of thin films, used in a range of energy applications from photovoltaics to batteries. The complexity of thin films means that device performance and degradation are affected by a combination of characteristics, and their assessment requires a new analytical approach to combined data analysis.

This project will use results from ENG53 ThinErgy to develop a European hybrid metrology capability for the characterisation of thin film performance and durability in energy applications. This will include the development of new methods to enable datasets from multiple measurements to be combined. The new capabilities will aid the development of new, innovative energy technologies based on thin films, in turn supporting progress towards energy efficiency and renewable energy targets.

Coordinator

National Physical Laboratory (www.npl.co.uk)

Participants

18

Countries

United Kingdom, Germany, Czech Republic, Netherlands, Switzerland, France

Funding scheme

Joint Research Project

Total Duration

36 Months

2017/06/01 - 2020/05/31

AEROMET – Aerosol metrology for atmospheric science and air quality

http://www.aerometproject.com/

BAM Contact:
4.2 Materials and Air Pollutants
Dr. Stefan Seeger
Stefan.Seeger@bam.de
+49 30 8104 3802

Accurate measurements of airborne particles are vital for enforcing EU air quality regulations aimed at protecting human health and understanding and limiting the effects of climate change. Current methods for the measurement of mass of PM10 and PM2.5 (airborne particles less than 10 and 2.5 microns in diameter, respectively) specified by the Air Quality Directive need improving to ensure results given by instruments based on different working principles (such as gravimetric and optical measurement) can be compared. In addition, knowledge of the size and number concentration of unregulated nanoscale ultra-fine particles (UFP) is needed as a prerequisite to any future regulatory limits.

This project will use results from EMRP project ENV02 PartEmission to support CEN standardization on EU guidelines for PM and UFP measurement by improving the uncertainty of particle mass, size and number concentration measurements. It will also support the characterization of regulated components in airborne particles as needed by Europe's air quality networks to better understand health risks, and local and global trends.

Coordinator

National Physical Laboratory (www.npl.co.uk)

Participants

18

Countries

Germany, Czech Republic, Denmark, Italy, France, Switzerland, Norway, United Kingdom

Funding scheme

Joint Research Project

Total Duration

36 Months

2016/07/01 - 2019/06/30

ReMIND – Role of metals and metal containing biomolecules in neurodegenerative diseases such as Alzheimer's

https://www.ptb.de/emrp/remind-home.html

BAM Contact:
1.1 Inorganic Trace Analysis
Dr. Jochen Vogl
Jochen.Vogl@bam.de
+49 30 8104 1144

Over 6 million people are affected by neurodegenerative diseases in the EU and this number is set to double over the next 20 years. Early diagnosis of Alzheimer's disease, the most common form of neurodegeneration, can help patients access effective treatments and sources of support, but studies suggest only half of people with the condition have been diagnosed and these cases are often only identified in the advanced stages. One of the key reasons for this is the lack of accuracy involved in the measurement of biomarkers used to indicate Alzheimer's disease. This project will use the achievements of EMRP project HLT05 Metallomics to improve this accuracy by establishing new reference measurement procedures for established biomarkers in cerebrospinal fluid, found in the brain and spine, while also introducing procedures for potential new blood-based biomarkers. This will support reliable, comparable measurements in current diagnostic tests and further the development of population-based screening through blood testing, which is urgently required to enable earlier diagnosis of Alzheimer's disease.

Coordinator

Physikalisch-Technische Bundesanstalt (www.ptb.de)

Participants

8

Countries

Germany, United Kingdom, Turkey

Funding scheme

Joint Research Project

Total Duration

36 Months

MetVBadBugs

2016/05/01 - 2019/04/30

MetVBadBugs – Quantitative measurement and imaging of drug-uptake by bacteria with antimicrobial resistance

http://empir.npl.co.uk/metvbadbugs/

BAM Contact:
6.1 Surface Analysis and Interfacial Chemistry
Dr. Wolfgang Unger
Wolfgang.Unger@bam.de
+49 30 8104 1823

In Europe, antimicrobial resistance is responsible for approximately 25 000 deaths a year with annual treatment and social costs estimated at around €1.5 billion. Drug-resistant Gram-negative bacteria are responsible for two thirds of these deaths and a key measurement challenge surrounds the effective penetration of antibiotic drugs into the bacteria. These bacteria have a double membrane and protein pumps that rapidly remove antimicrobial drugs that penetrate the membrane, before they can take effect. Although many of the molecular mechanisms involved in these steps are known, the dynamics of each step are unclear. This project will develop innovative measurement capabilities that will be able to quantify and image the penetration of drugs into Gram-negative bacteria and measure the accumulation and removal of the drug. The tools and understanding generated will provide vital help to scientists optimising antimicrobial drugs to combat these deadly bacteria.

Coordinator

National Physical Laboratory (www.npl.co.uk)

Participants

13

Countries

Germany, Czech Republic, United Kingdom, Italy

Funding scheme

Joint Research Project

Total Duration

36 Months

2015/07/01 - 2017/06/30

TF Standard – Developing a Standard for Valid Methodology for the Characterization of Functional Alloy Thin Films

https://www.euramet.org/

BAM Contact:
6.1 Surface Analysis and Interfacial Chemistry
Dr. Wolfgang Unger
Wolfgang.Unger@bam.de
+49 30 8104 1823

Thin film materials possess novel properties, which make them ideal for use in solid state lighting and solar panels. Precise analysis of the composition and structural properties of the films is crucial to their development and exploitation, as it greatly affects their performance. Many industries, including instrument manufacturers such as Helmut Fischer GmbH, need access to appropriate calibration samples and reference materials to enable them to make precise and reliable analysis of thin films for process control and quality management. EMRP project IND07 developed traceable measurement techniques to determine the composition and indepth gradient of thin film samples.

This project built on these results to provide thin film calibration samples and standard industry operating procedures for traceable measurements of composition through an inhomogeneous film.

The project also generated a New Work Item Proposal (NWIP) for ISO/TC 201 (Surface Chemical Analysis) for the use of thin film reference materials for X-Ray Fluorescence (XRF) analysis for the characterisation of functional alloy thin films where up to now no Certified Reference Materials were available.

Coordinator

Physikalisch-Technische Bundesanstalt (www.ptb.de)

Participants

2

Countries

Germany

Project Type

Support for Impact Project

Total Duration

36 Months

2015/06/01 - 2018/05/31

Strength ABLE – Metrology for large-scale engineering of materials

http://empir.npl.co.uk/strength-able/

BAM Contact:
5.1 Materialography, Fractography and Ageing of Engineered Materials
Dr. Axel Kranzmann
Axel.Kranzmann@bam.de
+49 30 8104 1510

According to conventional understanding regarding the strength of materials, a small and a large beam of the same material will fail under the same stress. However, in reality the small beam is stronger and this 'size effect' can change the strength of a material by up to an order of magnitude. Industry has found that this size effect mechanism can be exploited through the addition of different atom sizes, particles and grain boundaries. Current state-of-the-art understanding of the interaction between these size effects is limited, and industry has had to make do with empirical relationships relating to individual length-scales.

A validated, joined-up understanding of the mechanisms behind 'smaller being stronger' is needed to realise the material and component performance benefits that length-scale engineering offers. This project will produce design rules and new measurement techniques which will enable industry to exploit length-scale engineered materials and create components that are lighter, stronger, and fatigue and wear resistant.

Coordinator

National Physical Laboratory (www.npl.co.uk)

Participants

2

Countries

United Kingdom, Germany, Czech Republic, Denmark, Italy

Project Type

Support for Impact Project

Total Duration

36 Months

2015/06/01 - 2018/05/31

ENVCRM – Matrix reference materials for environmental analysis

http://www.envcrm.com

BAM Contact:
1.1 Inorganic Trace Analysis
Dr. Jochen Vogl
Jochen.Vogl@bam.de
+49 30 8104 1144

Drinking water, agricultural soil, and plant and animal habitats are all at risk of environmental pollution. Increased industrialisation, the use of chemicals in agriculture and the consumption of fossil fuels drive a greater need for monitoring such pollution. However, reliable analysis of water, sediment and soil samples for the purpose of environmental pollution assessment is a significant challenge due to the complexity of samples and the low concentrations of pollutants. Laboratories performing sampling need certified reference materials (CRMs), representative of real samples, to demonstrate traceability of measurements and ensure a quality-controlled process. This project aims to develop the capacity to produce CRMs for environmental analysis by transferring the theoretical and practical know-how between project partners and combining their skills. This will have an impact on environmental monitoring in participating countries and on the broader scientific community.

Coordinator

National Metrology Institute of Turkey (www.ume.tubitak.gov.tr)

Participants

9

Countries

Turkey, Germany, Poland, Slovenia, Bosnia and Herzegowina, Serbia, Finland

Project Type

Support for Impact Project

Total Duration

36 Months

2015/06/01 - 2018/05/31

Innanopart – Metrology for innovative nanoparticles

http://empir.npl.co.uk/innanopart/

BAM Contact:
1.2 Biophotonics
Dr. Ute Resch-Genger
Ute.Resch@bam.de
+49 30 8104 1134

Nanoparticles, due to their unique and tuneable properties, are ideal for a wide variety of potential applications and are increasingly being used in commercial products, from conductive inks for printed electronics to drug delivery agents for the pharmaceutical industry. Industries developing innovative products containing nanoparticles need to accurately control a number of their properties. Two properties which significantly affect performance are nanoparticle number concentration and surface chemistry. These properties enable compliance with EU regulation regarding the definition of a nanomaterial, and underpin claims of reliability, performance and lifetime for nanoparticle products.

However, industry is currently lacking certified reference materials, primary standards and methods of measurement for these two properties. This project will provide industry with techniques and methods for the measurement of nanoparticle number concentration and surface chemistry. This will support trade in high performance nanoparticles for advanced technologies and the competitiveness of European nanotechnology industries will be strengthened.

Coordinator

National Physical Laboratory (www.npl.co.uk)

Participants

11

Countries

United Kingdom, Germany, Denmark, Sweden, Italy, Switzerland

Funding scheme

Joint Research Project

Total Duration

36 Months

2014/10/01 - 2017/09/30

MeTra – Traceability for Mercury Measurements

http://projects.lne.eu/MeTra/

BAM Contact:
1.8 Environmental Analysis
Dr. Christian Piechotta
Christian.Piechotta@bam.de
+49 30 8104 1166

Mercury in its many chemical forms is highly toxic to human, animal and environmental health. It occurs naturally in the environment, and in addition human activity has increased mercury levels over the last 100 years.

In order to prevent the global environmental pollution and damage to health caused by mercury, a new global and legally binding convention aimed at reducing global mercury emissions, the Minamata Convention, was signed and agreed by 185 countries in 2013.

European Directives on mercury require the enforcement of target values for mercury in the environment. This project developed new traceable measurements and the measurement infrastructure needed to support EU legislation and the global convention aimed at reducing global mercury emissions.

Coordinator

French National Laboratory for Metrology and Testing LNE (www.lne.fr)

Participants

14

Countries

France, Germany, Slovenia, United Kingdom, Finland, Turkey, Netherlands

Funding scheme

Joint Research Project

Total Duration

36 Months

2014/07/01 - 2017/06/30

VITCEA – Validated inspection techniques for composites in energy applications

http://projects.npl.co.uk/vitcea/

BAM Contact:
8.7 Thermographic Methods
Dr. Christiane Maierhofer
Christiane.Maierhofer@bam.de
+49 30 8104 1441

The excellent mechanical properties of fibre reinforced plastic (FRP) composites gives them considerable advantages for use in renewable energy (wind, wave and tidal), oil and gas, and transport applications. The low weight, strength, fatigue and corrosion resistance mean that FRP composites have the potential to reduce fossil fuel reliance, energy consumption and greenhouse gas emissions. However, FRP composites can contain a diverse range of defects and damage mechanisms that can reduce the strength, stiffness and life of a structure. These can be difficult to detect, but reliable non-destructive evaluation (NDE) would aid characterisation of FRP material quality and encourage their full exploitation.

Defects can be detected and sized using a range of NDE techniques, which has been done quite widely for high performance composites in the aerospace industry. However there is less evidence of the suitability, applicability and limits of detection for NDE for FRP products in energy applications, e.g. wind and marine turbine blades, nacelles, and oil and gas flexible risers, where different materials and varying thicknesses are used. This project looked at several NDE techniques to determine the relative applicability and suitability for defect detection in FRP, in a range of energy applications, as well as the development of operational procedures for each technique, so that users can have confidence in component performance and working life of FRP composites.

Coordinator

National Physical Laboratory (www.mah.se)

Participants

6

Countries

Germany, United Kingdom, Czech Republic

Funding scheme

Joint Research Project

Total Duration

36 Months

2014/07/01 - 2017/06/30

ThinErgy – Traceable characterization of thin-film materials for energy applications

http://www.ptb.de/emrp/thinergy.html

BAM Contact:
6.7 Surface Modification and Measurement Technology
Dr. Andreas Hertwig
Andreas.Hertwig@bam.de
+49 30 8104 3515

EU targets for the use of renewable energy and energy efficient devices are driving rapid growth in the global market for low-carbon goods and services, resulting in increasing demand for advanced materials and related technologies. Thin films, with a thickness from a fraction of a nanometre to several micrometres, are key components in numerous energy applications such as solar cells, LEDs, energy efficient windows and solid state power electronics which are used to control the flow of electricity from the grid.

The lack of reliable measurement protocols and calibration procedures for thin films has hampered the development of these technologies. A key challenge is that thin film materials typically have complex structures, requiring multiple characterisation techniques to analyse them adequately.

This project developed a measurement framework for reliably characterising thin films, and has delivered new instrumentation, industrial consultancy, calibration services, standards documents, new solar cell technology, and a spin out company.

Coordinator

National Physical Laboratory (www.npl.co.uk)

Participants

14

Countries

United Kingdom, Germany, Czech Republic, Denmark, France, Finland, Netherlands

Funding scheme

Joint Research Project

Total Duration

36 Months

2014/10/01 - 2017/09/30

KEY-VOCs – Metrology for VOC indicators for air pollution and climate change

http://www.key-vocs.eu/

BAM Contact:
4.2 Materials and Air Pollutants
Dr. Wolfgang Horn
Wolfgang.Horn@bam.de
+49 30 8104 1426

Volatile Organic Compounds or VOCs are organic compounds or chemicals that contain carbon and easily become vapours or gases. They are found in many products commonly used every day.

Some VOCs are dangerous to human health whilst others cause harm to the environment by influencing the oxidative capacity of the atmosphere, contributing to the production of other air pollutants as well as to greenhouse gases and ozone, and by being also involved in the formation of secondary organic aerosols. These VOCs are regulated by European legislation.

This project improved the measurement infrastructure for key VOCs in air by providing traceable and comparable reference gas standards and by validating new sensor-based measurement systems in support of the air monitoring networks and the EU regulations.

Coordinator

Dutch National Metrology Institute (www.vsl.nl)

Participants

14

Countries

Netherlands, Germany, Czech Republic, Italy, France, Switzerland, United Kingdom, Turkey

Funding scheme

Joint Research Project

Total Duration

36 Months

Joint Programming Initiatives (JPIs) and ERA-Nets

Joint Programming Initiatives (JPIs) and ERA-Nets aim at deepening coordination of national funding programmes and at lessening the fragmentation of European research activities. JPIs and ERA-Nets are set up and primarily financed by EU member states with support from the EU research and innovation framework programs.

JPI participations

Collaborative projects

2017/10/01 - 2020/04/30

Beat-AMR – Partnership against Biofilm-associated Expression, Acquisition and Transmission of AM

https://netzwerke.bam.de/

BAM Contact:
4.1 Biodeterioration and Reference Organisms
Dr. Frank Schreiber
Frank.Schreiber@bam.de
+49 30 8104 1414

A relatively recent advance in microbiology is the finding that the majority of infections are caused by bacterial biofilms. Biofilms are structured communities of bacteria found on surfaces that become embedded within a self-produced extracellular polymeric matrix. Biofilms can form on tissues or on biomedical surfaces, such as blood catheters or implants, where they act as a reservoir of potential healthcare associated infection.

Bacteria living in biofilms can tolerate much higher antibiotic concentrations compared to planktonic bacteria and survive long enough to evolve antimicrobial resistance (AMR). They form persistent, hard to treat infections and exhibit an intrinsic biology that promotes the development and transmission of AMR.

The goal of our consortium is to determine how bacteria adapt to antimicrobials during biofilm formation on surfaces coated with antimicrobials, how AMR mutations are acquired and evolve within mature biofilms, and how population dynamics within biofilms affect the transmission of AMR.

We address the hypothesis that understanding the contribution of biofilms to AMR acquisition and spread will lead to the development of novel antimicrobial strategies and medical devices that are more effective in preventing biofilm-associated infection and AMR.

Our team provides facilities and clinical research governance for experimental and translational medicine. Our synergy of leading laboratory, clinical and translational research across Europe will ensure the best chance to develop novel and successful interventions and therapeutic outcomes.

Coordinator

Frank Schreiber, BAM (www.bam.de)

Participants

5

Countries

Germany, Switzerland, Netherlands, United Kingdom

JPI

Joint Programming Initiative on Antimicrobial Resistance (JPIAMR) (https://www.jpiamr.eu/)

Total Duration

31 Months

ERA-Net participations

Collaborative projects

2018/07/01 - 2021/06/30

TARQUS – Modeling-aided design of a TernARy Quantum dot-based platform for multiplexed cell analysis

BAM Contact:
1.2 Biophotonics
Dr. Ute Resch-Genger
Ute.Resch@bam.de
+49 30 8104 1134

Fast and highly sensitive detection of an ever increasing number of analytes in parallel is of great importance for life sciences. To address these challenges, we will develop a versatile platform of differently sized particles based on the modeling modeling-aided design of cadmium-free ultrabright ternary semiconductor quantum dots (t-QDs) like Ag-In-S (AIS) and Cu-In-S (CIS) QDs with varying elemental composition and inorganic passivation shells for precise control of the photoluminescence (PL) in the visible and near infrared for multiplexed analysis of single cell lysates and pathogens in the color, intensity, and lifetime (LT) domain.

These t-QDs, which show relatively broad emission bands and long LTs of about 100-300 ns, will be used for i.) color and LT-encoding of ?m-sized polymer beads, subsequently surface-functionalized with targetspecific bioligands and ii.) (time-resolved, TR) fluorescence resonance energy transfer (FRET) assays, with one t-QD acting as FRET donor for up three spectrally distinguishable organic dyes employed as labels of different antibodies. t-QD design will involve modeling of electronic energy structures of AIS and CIS QDs as well as optimum chemical composition and shell structures. FRET efficiencies will be modeled with e.g., density functional and kp-perturbation theory. Pursued detection schemes for representative biomarkers from cell lysates and pathogens will include a microfluidic device, a miniaturized flow cytometer (FCM), and a novel LT FCM, discriminating beads by their LT codes and quantifying dye-labeled bead-bound biomolecules in the intensity domain in a separate detection channel. The outcome of the project will be a unique detection technology for life sciences and a new interdisciplinary network of scientists in Russia, Switzerland, and Germany involving knowledge transfer, e.g., modeling from Russia to EU and microfluidic technology to Russia and exchange of young scientists.

Coordinator

Ute Resch-Genger, BAM (www.bam.de)

Participants

3

Countries

Germany, Switzerland, Russia

ERA-Net

RUS Plus (http://www.eranet-rus.eu)

Total Duration

36 Months

2018/09/01 - 2020/12/31

EI-GEO – Environmental Impact of geosynthesis in aquatic systems

BAM Contact:
4.3 Contaminant Transfer and Environmental Technologies
Dr. Franz-Georg Simon
Franz-Georg.Simon@bam.de
+49 30 8104 1430

Geosynthetics are widely used in hydraulic engineering in aquatic ecosystems such as in revetment measures for coastal protection or in ballast layers for wind energy plants. An increasing application of geosynthetics is observed due to expansion of offshore wind energy generation and protection to rising water levels and more extreme weather conditions as a result of climate change. While providing various economic and technical benefits, the application of geosynthetics in hydraulic engineering projects has been questioned recently as these materials might degrade during their lifetime and induce a hazardous impact on the aquatic environment in a long term especially as the origin of plastic debris or as source/sink for chemicals such as plasticizers and stabilizers used in the production of geosynthetics to improve their performance. The proposed project is aimed at a substantial contribution to the risk assessment of the application of geosynthetics in hydraulic engineering. Accelerated artificial ageing of geotextiles used in marine applications will be applied in a laboratory scale and the performance characteristics will be compared with the virgin material. Whereby, a combination of mechanical, chemical and microbiological stress will be simulated. Additionally, the leaching behavior in relation to the ongoing ageing process as well as the ecotoxicological impact of leachates in marine environment will be investigated. The laboratory tasks will be accompanied by a field case study at the Kaliningrad shore. Regarding the generation of microplastics due to material failure or ageing of geosynthetics standardized procedures for sample collection, preparation and identification have been identified as a crucial issue for authorization of application in hydraulic engineering.

Coordinator

Franz-Georg Simon, BAM (www.bam.de)

Participants

3

Countries

Germany, Russia, Latvia

ERA-Net

RUS Plus (http://www.eranet-rus.eu)

Total Duration

28 Months

2018/05/01 - 2022/04/30

BASH-TREAT – Optimization of bottom ash treatment for an improved recovery of valuable fractions

BAM Contact:
4.3 Contaminant Transfer and Environmental Technologies
Dr. Franz-Georg Simon
Franz-Georg.Simon@bam.de
+49 30 8104 1430

While incineration established itself as the best treatment option for municipal and industrial waste, with around 90 Mt/y of waste treated in EU incinerators, the management of its main residue, that is bottom ash, rapidly became a crucial point in the waste chain. With 80 – 85 % (w/w) of mineral fraction and a valuable 10 – 12 % of metals, the recovery of residual useful components from bottom ash is a complex challenge for EU (20 % w/w of metals contained in bottom ash are not yet recovered), that may lead to important technical, socio/economic and environmental outcomes. BASH-TREAT objectives are: 1) a complete assessment of EU state-of-the-art bottom ash treatment options considering technical/economic/environmental viewpoint; 2) an optimization of the exploitation of the refining treatment of the fine fraction deriving from full-scale trial tests; 3) the development of EU guidelines for the enhanced and innovative full valorisation of valuable components of bottom ash (metals and mineral fraction). What is expected from BASH-TREAT is a database with information about performances, results, characteristic of bottom ash treatment in EU and suggestion for process improvement. The validation of the data via full-scale treatment plant plants. The development of new innovative technologies for the treatment of the fine fraction in a lab scale process. The technical, economical and environmental assessment will be performed for all the aspects faced in the project. An international, interdisciplinar and intersectoral consortium composed by two universities, one research center and two industrial partners with provide different and specific expertisecompetences will face BASH-TREAT research activities.

Coordinator

Hamburg University of Technology (www.tuhh.de)

Participants

5

Countries

Germany, Italy, Sweden

ERA-Net

ERA-NET Cofund on Raw Materials 2 (www.era-min.eu)

Total Duration

36 Months

2016/01/01 - 2018/31/12

NanoHype – Nanoparticle Hybrid Materials Using Plasmonic-Enhanced Upconversion FRET for Multiplexed Sensing and Optical Barcoding

BAM Contact:
1.2 Biophotonics
Dr. rer. nat. Ute Resch-Genger
Ute.Resch@bam.de
+49 30 8104 1134

1.2 Biophotonics
Dr. Michael Schäferling
Michael.Schaeferling@bam.de
+49 30 8104 1167

The nanohype project will combine computational modeling, synthesis, and experimental validation to design novel metalshelled upconverting nanoparticles (UCNPs) with 1) a 50-fold enhanced photoluminescence (PL) quantum yield compared to conventional UCNPs; 2) tunable PL lifetimes between 100 ns and 600 µs; 3) tunable PL colors by multiplexed Förster Resonance Energy Transfer (FRET) to quantum dots (QDs) or dyes; and 4) colloidal stability in aqueous solutions. The multidisciplinary nanohype consortium will create new synergies and improved predictive power by modeling multifunctional photoluminescent nanomaterials (PNMs) for targeted material design and engineering. Direct validation of modeling results by experimental demonstration will be a benchmark for future PNM designs and a necessary and highly relevant step for the future integration of such PNMs in industrial production and innovative applications.

Coordinator

Paris-Sud University (www.u-psud.fr)

Participants

5

Countries

France, Germany, Spain

ERA-Net

M-ERA.NET
(www.m-era.net)

Total Duration

36 Months

2016/03/15 - 2019/12/31

Micropores-HIP – Modeling of annihilation of micropores in single-crystal nickel-base superalloys during hot isostatic pressing

BAM Contact:
5.2 Experimental and Model Based
Mechanical Behaviour of Materials
Dr.-Ing. Bernard Fedelich
Bernard.Fedelich@bam.de
+49 30 8104 3104

High-pressure turbine blades are critical components of aircraft engines. They are cast as singlecrystals of nickel-base superalloys. A negative side effect are casting micropores initiating fatigue failure. The pores can be removed by hot isostatic pressing (HIP), however this technological process, performed at temperature close to solidus, can damage a costly blade by recrystallization and incipient melting. The objective of our project is to develop a computational HIP model for the simulation of micropore annihilation, enabling to optimize the HIP parameters. The target property is blade material without pores with fatigue life increased by many times. Pore annihilation in single-crystals at an ultrahigh homologous temperature of about 0.97 is a complex multiscale physical process. Therefore the computational HIP model will be composed of several physical and phenomenological models considering phenomena from the atomic level up to the continuum level.

Coordinator

Technical University of Berlin (www.tu-berlin.de)

Participants

4

Countries

Germany, France

ERA-Net

M-ERA.NET
(www.m-era.net)

Total Duration

45,5 Months

2015/01/01 - 2018/11/30

ICENAP – Integrated Computational Engineering, Characterization and Validation of Semiconductor Colloidal Nanocrystals with Advanced Properties

BAM Contact:
1.2 Biophotonics
Dr. Ute Resch-Genger
Ute.Resch@bam.de
+49 30 8104 1134

ICENAP will design new nanocrystals and tailor microstructural changes in known ones during processing to obtain the following improved properties: – photoluminescent (PL) quantum yield exceeding 90% irrespective of QD concentration; – minimum blinking; – inorganic shells designed to ensure stable QD PL for at least 12 months; – organic shells ensuring QD stability in biological media for at least 6 months. New technologies will be developed based on modeling and simulation using material physics-based design principles. The results will be used for the synthesis of QD cores and their layer-by-layer coating with inorganic shells, utilizing structural models that fit their structure seen in HRTEM. The predicted properties of this next generation QDs will be experimentally validated. ICENAP combines modeling, simulation and validation of a new class of nanomaterials, which will have a strategic impact and create new dynamism by accumulation of new knowledge along the innovation chain.

Coordinator

University of Reims Champagne-Ardenne (www.univ-reims.fr)

Participants

4

Countries

Germany, France

ERA-Net

M-ERA.NET (www.m-era.net)

Total Duration

47 Months

COST (European Cooperation in Science and Technology)

COST (European Cooperation in Science and Technology) is an intergovernmental initiative to support European cooperation in science and technology. COST funds pan-European networks on clearly defined topics for up to four years. COST Actions thus provide a forum for exchange among researchers and enable the coordination of research activities and dissemination of results.

COST-Actions

Collaborative projects

COST Action TU1402: Quantifying the Value of Structural Health Monitoring

2014/11/13 - 2018/11/12

Quantifying the value of structural health monitoring

www.cost-tu1402.eu

BAM Contact:
8.2 Non-Destructive Damage Assessment and Environmental Measurement Methods
Dr. Ernst Niederleithinger
Ernst.Niederleithinger@bam.de
+49 30 8104 1440

This COST Action enhances the benefit of Structural Health Monitoring (SHM) by novel utilization of applied decision analysis on how to assess the value of SHM – even before it is implemented. This improves decision basis for design, operation and life-cycle integrity management of structures and facilitates more cost efficient, reliable and safe strategies for maintaining and developing the built environment to the benefit of society. SHM is increasingly applied for collecting information on loads and aggressive environments acting on structures, structural performances, deterioration processes and changes in the use of structures. However, there is an urgent need to establish a better understanding of the value of SHM before its implementation, together with practically applicable methods and tools for its quantification. This Action thus aims to develop and describe a theoretical framework, together with methods, tools, guidelines, examples and educational activities, for the quantification of the value of SHM. The COST Action will be conducted with the support of the Joint Committee on Structural Safety (JCSS). The networks of researchers and industries established during COST Actions TU0601, C26, E55 and E24, the EU FP7 project IRIS, the Marie Curie Network SmartEn and the JCSS will ensure visibility, impact and dissemination.

Coordinator

Technical University of Denmark (www.dtu.dk)

Participants

29

Total Duration

48 Months

2014/11/18 - 2018/11/17

Towards the next generation of standards for service life of cement-based materials and structures

https://www.tu1404.eu/

BAM Contact:
7. Safety of Structures
Dr.-Ing. Jörg Unger
Joerg.Unger@bam.de
+49 30 8104 3787

Cement-based materials (CBM) are the foremost construction materials worldwide. Therefore, there are widely accepted standards for their structural applications. However, for service life designs, current approaches largely depend on CBM strength class and restrictions on CBM constituents. Consequently, the service life behaviour of CBM structures is still analysed with insufficiently rigorous approaches that are based on outdated scientific knowledge, particularly regarding the cumulative behaviour since early ages. This results in partial client satisfaction at the completion stage, increased maintenance/repair costs from early ages, and reduced service life of structures, with consequential economic/sustainability impacts. Despite significant research advances that have been achieved in the last decade in testing and simulation of CBM and thereby predicting their service life performance, there have been no generalized European-funded Actions to assure their incorporation in standards available to designers/contractors.Therefore, the main purpose of this COST Action is to bring together relevant stakeholders (experimental and numerical researchers, standardization offices, manufacturers, designers, contractors, owners and authorities) in order to accelerate knowledge transfer in the form of new guidelines/recommendations, introduce new products and technologies to the market, and promote international and inter-speciality exchange of new information, creating avenues for new developments.

Coordinator

University of Minho (www.uminho.pt)

Participants

30

Total Duration

48 Months

2016/03/04 - 2020/03/03

MINEA – Mining the European Anthroposphere

http://www.minea-network.eu/

BAM Contact:
4.3 Contaminant Transfer and
Environmental Technologies
Dr. Franz-Georg Simon
Franz-Georg.Simon@bam.de
+49 30 8104 1430

Traditional mining continuously shifts raw materials from the geosphere to the anthroposphere. These materials accumulate in anthropogenic deposits (e.g. cars, buildings) and pose a resource potential that includes the secondary materials of tomorrow. To provide information on the future availability of primary materials, inventories of geogenic deposits (resources) and the economically extractable shares (reserves) have been developed. In contrast, information on the availability of secondary materials is lacking. Even though the amount of materials in the anthroposphere has risen dramatically in the last few decades, the resource potential in anthropogenic deposits has not been explored in an adequate way. This prevents, firstly, a comparison of resources/reserves between primary and secondary materials and, secondly, integrated information on the availability of materials from reaching future commodity markets. To overcome this gap, this COST Action aims to actuate the reporting of material resources/reserves in the anthroposphere. The focus is on (1) construction and demolition waste, (2) waste regained from landfills and (3) solid residues from waste incineration. Today, there are large differences concerning the recovery of secondary materials from these three types of waste across Europe due to isolated national research, waste management technologies and policy strategies. A pan-European approach is needed to establish a common knowledge base for the assessment of resource potentials on various spatial levels. By means of coordinating national research activities in European countries, this COST Action is striving for a breakthrough in the integrated assessment of primary and secondary resource potential, which is a prerequisite for effective resource management.

Coordinator

Technical University of Vienna (www.tuwien.ac.at)

Participants

28

Total Duration

48 Months

Presidential Staff Office
Research Coordination/International Cooperation

Dr. Claudia Eggert
☎ +49 308104-1004
✉ Claudia.Eggert@bam.de

Gunnar Tan M.A.
☎ +49 308104-1011
✉ Gunnar.Tan@bam.de

Bundesanstalt für Materialforschung
und -prüfung (BAM)
Unter den Eichen 87
12205 Berlin, Germany

✉ Info@bam.de
🌐 www.bam.de

Projects as of July 2018

20180280 - BAM Medienteam