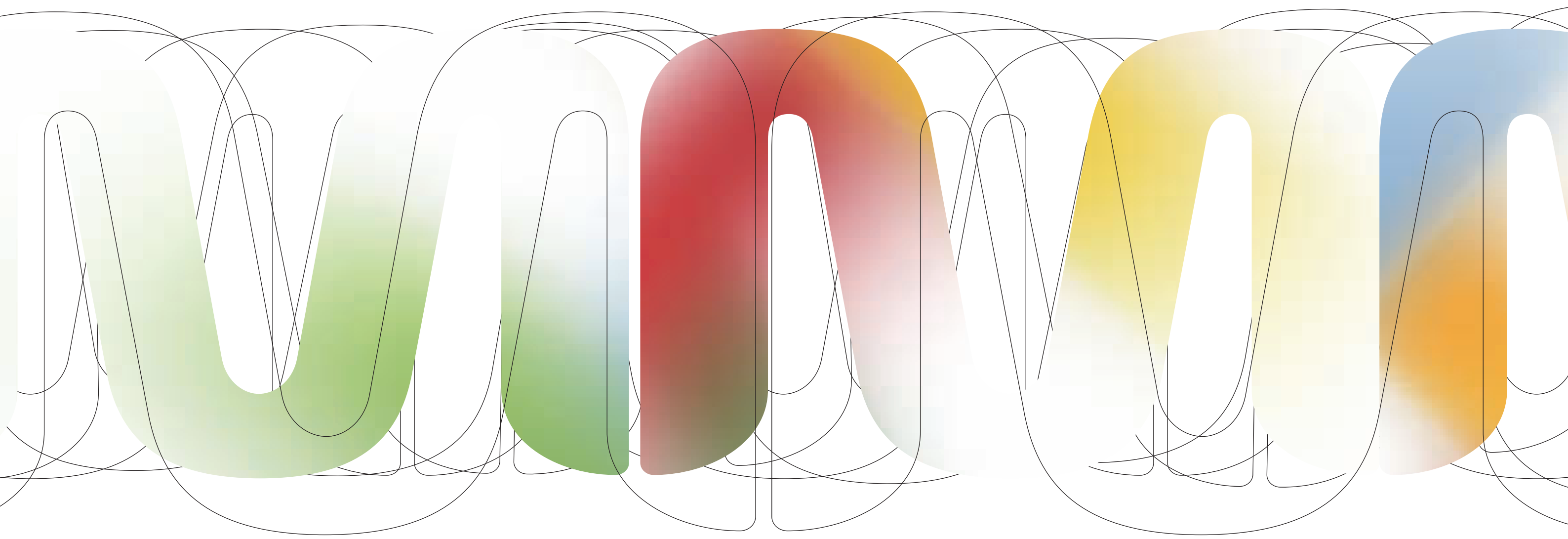

MATERA ERA-NET

Strengthening of new innovative materials science and engineering in Europe

MATERA

What is ERA-NET?

The ERA-NET scheme is an initiative of the European Commission aimed at providing support for the coordination and mutual opening up of national and regional R&D programmes. MATERA, an ERA-NET on materials, focuses on creating a durable cooperation platform for national and regional policy makers and managers with strategic activities in materials science and engineering.

MATERA ERA-NET

Strengthening of new innovative materials science and engineering in Europe

Material sciences and technology has a great, positive impact on the quality of human life, on sustainable development and also on the competitiveness of industry. It is important to intensify the innovation value chain from basic materials science and engineering to the benefit of European society and business.

The MATERA ERA-NET promotes cooperation between national and regional programmes on material science and engineering.

MATERA has brought together an active network of 18 organisations from 16 countries.

25 trans-national projects under way - next call in 2011

So far, four joint calls for industry, universities and research centres have been launched (2006, 2007, 2008, 2010). Thanks to MATERA altogether 25 trans-national projects with about 19 million euros public funding are under way.

In 2009, an ERA-NET Plus Call on materials (MATERA+) was launched with an option of additional EC financial support. As an outcome of the call, 21 trans-national projects were selected for funding. The requested volume of the public funding is about 15 million euros, EC's financial contribution is planned to be one third of that.

The evaluation of call 2010 is ongoing. The next MATERA call is planned to be launched at the end of year 2010.

www.matera.fi

MATERA

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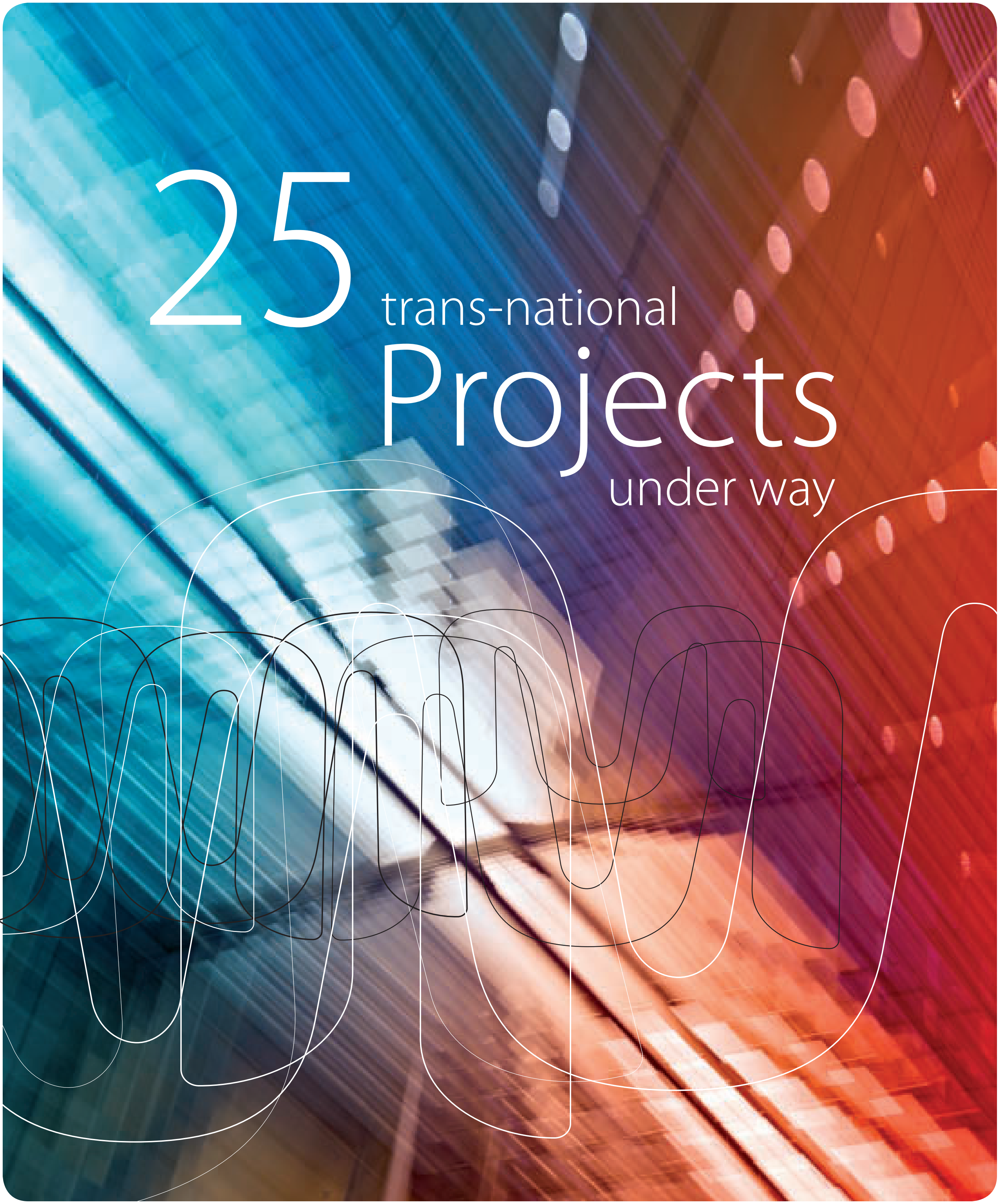
25
trans-national
Projects
under way

FOULSURFACE

Molecular level interaction between a particle and a surface in liquid based systems

PROJECT COORDINATOR	Eini Puhakka
ORGANISATION	VTT Technical Research Centre of Finland
COUNTRY	Finland
PROJECT PARTNERS	University of Oulu / Finland SINTEF / Norway University College Dublin / Ireland
PROJECT DURATION	01/2007 – 12/2009
FUNDING AGENCIES	Tekes / Finland RCN / Norway EI / Ireland

New understanding of fouling phenomena was achieved, and new coatings in order to restrain fouling on heat transfer surfaces were developed in the project. The executed interdisciplinary research work consisted of modelling, preparation, characterization and testing of coatings, and modelling and experimental examination of crystallization and particulate fouling.

For controlled fouling experiments, two test facilities were utilized. The designed and built laboratory scale apparatus was used to test small plate samples in order to select coatings for industrial tests and to gather experimental data for the computational fluid dynamics (CFD) simulations. The small plate heat exchanger installed into a side stream of the process was used to perform experiments in the real process conditions. Tests were performed for selected commercial and new developed laboratory-made physical and chemical vapour deposition coatings. It seems that superhydrophobic coatings are promising, but their usability depends on applications.

The formation mechanism of calcium carbonate depositions were defined at the molecular level. The formation energies of depositions correlate with the induction time of crystallization fouling, and the induction time also correlates with the surface energies of the coatings. The formation and surface energies can be utilized to estimate non-fouling properties of coatings.

The CFD fouling models for crystallization and particulate fouling were developed and validated. The models were utilized to describe fouling in the laboratory scale facility, and the particulate fouling model was also used to describe fouling in the industrial process. The distribution of real and simulated deposits on the heat transfer surfaces were qualitatively correct.

The project brought together different European research groups that historically had worked with different industries and had different scientific experience, and different industries, struggling with the same fundamental problems. By working together, the project group exploited synergetic effects across scientific, industrial and national borders.

DIWEAR

Wear Resistant Ductile Iron

PROJECT COORDINATOR	Birgir Johannesson
ORGANISATION	Innovation Center Iceland
COUNTRY	Iceland
PROJECT PARTNERS	Malmsteypa Thorgrims Jonssonar / Iceland Centre de Recherche Public – Gabriel Lippmann / Luxembourg Centre for Tribology and Technical Diagnostics, University of Lubljana / Slovenia
PROJECT DURATION	02/2007 – 06/2009
FUNDING AGENCIES	Rannis / Iceland FNR / Luxembourg MHEST / Slovenia

Ductile iron is used for components in demanding applications. Innovation Center Iceland and Malmsteypa Thorgrims Jonssonar have demonstrated that ductile iron can be reinforced locally. Microalloying gives a sharp gradient in composition, creating a functionalized surface in strategic locations where the component is heavily loaded. In this project, significant advances were made in understanding of the nature of this local reinforcement. Structure and composition of carbides and distribution of elements in the ductile iron were characterized. This is an essential step in understanding the mechanisms leading to local hardening. Wear properties of the locally reinforced ductile iron were measured and compared to conventional steel types used in wear demanding applications. Performance of the locally reinforced ductile iron was found to be equal to or better than that of the reference steels.

The results are already used in the production line of the foundry Málmsteypa Thorgrimur Jonssonar. The plan is to further exploit the results in demanding applications where the combination of high wear resistance and high thermal conductivity of the ductile iron is utilized. Further collaboration of the partners is being planned to exploit the results. The benefit for the foundry is primarily in a new technique which can be applied to many types of components. These benefits are already being exploited.

The significant advances which have been made in the project are primarily due to the collaboration between the partners. The collaboration has opened up new dimensions in terms of technical advances because of the expertise of the partners, and also in terms of identifying new applications for this newly developed material.

DECK

Defects in Chalcopyrites – advanced characterization

PROJECT COORDINATOR	Susanne Siebentritt
ORGANISATION	University of Luxembourg
COUNTRY	Luxembourg
PROJECT PARTNERS	Warsaw University of Technology, Poland Aalto University, Finland
PROJECT DURATION	09/2008 – 08/2011
FUNDING AGENCIES	FNR / Luxembourg MSHE / Poland AKA / Finland

The partners in DECK are working together to understand the defects in chalcopyrites ($Cu(InGa)Se_2$, short "CIS"), which is a compound semiconductor used in thin film solar cells. Solar cells based on CIS use less material and energy than conventional solar cells based on Si wafers, but show high efficiencies. CIS solar cells are industrially produced by companies worldwide, however a number of fundamental questions is still open. As in any semiconductor device, some defects are essential for the function of the solar cell, however others are detrimental.

By using a fancy method, that involves anti-electrons, we found that the main defect is actually a cluster of an empty Se site and an empty Cu or In site.

Another defect, that has been made responsible for limitations of these solar cells before, has been shown to disappear under illumination, so it will not limit the performance.

We have found that lateral changes in the absorption edge of the solar cells are due to the larger part to strain in the films, i.e. the crystal is under stress, rather than to compositional changes.

All these results are important hints how to further improve the performance of theses solar cells. They have been made possible only by the collaboration between the three groups, of which one has expertise in the preparation of the material, the other two specialise in very specific analysis tools.

MASTRA

Miniaturized all-solid-state sensors for trace analysis of substances relevant to health and welfare

PROJECT COORDINATOR	Johan Bobacka
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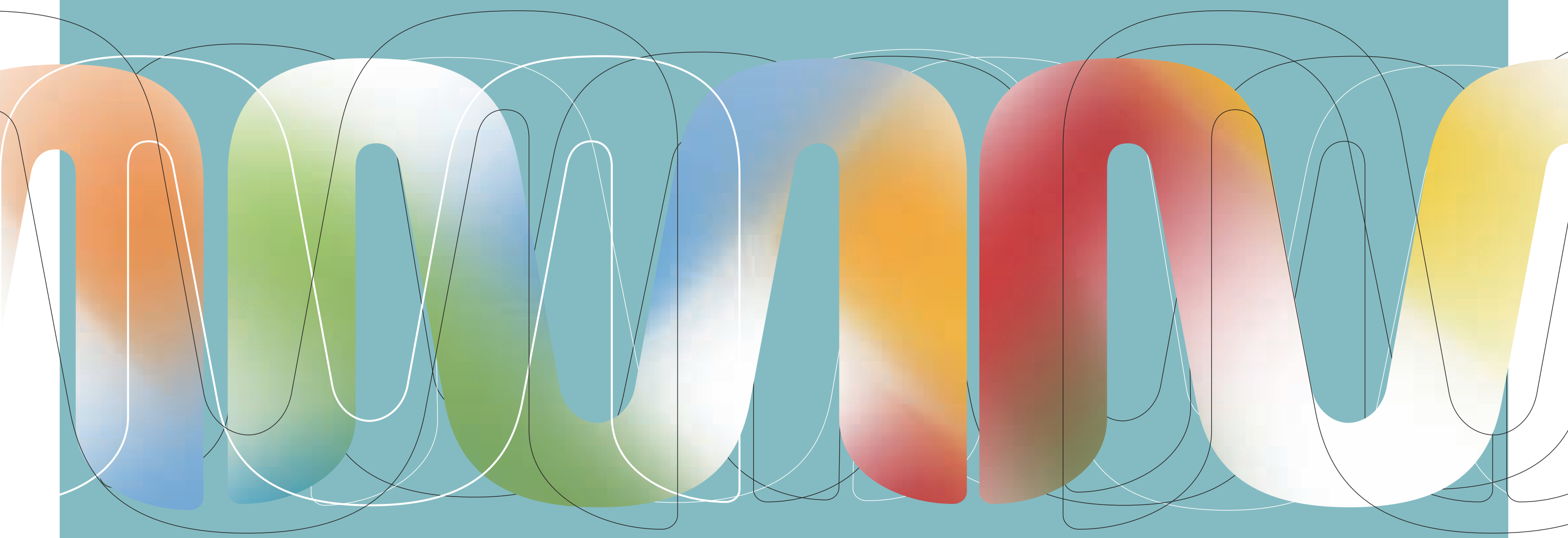
COUNTRY	Finland
PROJECT PARTNERS	AGH University of Science and Technology / Poland Dublin City University / Ireland Thermo Fisher Scientific / Finland DHN Ltd. / Poland Environmental Protection Agency / Ireland
PROJECT DURATION	1/2007 – 12/2009
FUNDING AGENCIES	Tekes / Finland MSHE / Poland EI / Ireland

Ion-selective electrodes (ISEs) have been known for more than one century. Still, in the last decade the performance of ISEs has been dramatically improved. Today, detection limits in the range of 10^{-8} – 10^{-11} mol/l can be achieved with ISEs. Such remarkable improvements make it possible to use ISEs in application fields that were previously considered unreachable e.g. environmental analysis and trace analysis. For these reasons, and particularly in order to make miniaturized and robust sensors, one of the main goals of the MASTRA project was to develop and to integrate solid-state ISEs with a solid-state reference electrode.

In the MASTRA project, conducting polymers were used as ion-to-electron transducers to obtain a common platform for solid-state ISEs and a solid-state reference electrode. Solid-contact ion sensors for measurement of Pb^{2+} and pH were successfully combined with a solid-contact reference electrode into a miniaturized potentiometric sensor system. The sensor system was developed and tested in real applications in close collaboration between project partners from Finland, Ireland and Poland.

The developed sensor systems were used to measure lead (Pb^{2+}) at very low concentrations (0.5–10 ppb) in natural waters. Furthermore, simultaneous measurements of pH and lead (Pb^{2+}) allowed speciation of lead in natural water samples. This is one of the first successful examples of an integrated potentiometric sensor system for environmental monitoring of heavy metals at low concentrations. In the future, the sensors will be used further towards development of wireless sensing networks.


25
trans-national projects



MATERA offers participants

A simplified way to initiate and participate in R&D projects at the European level
An opportunity to easily access international know-how
An opportunity to integrate into international value chains

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