

## Northern Ireland focus

### FP6-related success story

This issue features a project involving The Institute for Fire Safety Engineering Research and Technology at the University of Ulster.

#### PREFIRE

##### (Predicting Fire Behaviour of Nanocomposites from Intrinsic Properties)

Start date: 1.2.2005

End date: 21.1.2008

#### Project consortium

The PREFIRE project is supported as a Specific Targeted Research project under FP6 priority 3, Nanotechnologies and nanosciences, knowledge-based multifunctional materials and new production processes and devices. The project is coordinated by the University of Ulster. Michael Delichatsios, Professor of Fire Dynamics and Flammability and acting director at FireSERT (the Institute for Fire Safety Engineering Research and Technology), is responsible for the overall coordination and will direct the research at UU. The project consortium comprises the following partners:

- University of Ulster, UK (Coordinator)
- University of Bolton, UK
- University of Edinburgh, UK
- CDCMP, Center for Plastics Engineering, Italy
- Ecole Nationale Supérieure de Chimie de Lille, France
- Minelco Specialities Ltd, UK
- Clariant GmbH, Germany
- Kabelwerk-Eupen, Germany
- Fire and Environment Protection Service, Germany
- Swintex Ltd, UK
- Prime Polymers and Compounds Ltd, UK
- IRIS Vernici s.r.l., Italy
- TOLSA SA, Spain
- Essexford Joinery Works Ltd, Ireland

#### Project outline

The overall aim of the PREFIRE project is to develop a tool for the prediction of large-scale burning behaviour of polymer nanocomposites using intrinsic property data extracted from small-scale measurements. The focus is on both identifying the key intrinsic properties of these materials needed for predicting their fire behaviour and relating their dependence on their physical and chemical structure. Thus, the project will advance knowledge in the frontier areas of nanotechnology and fire prediction and will also enable the rapid development of fire-safe materials by providing the knowledge to design fire-safe polymer nanocomposites. The research focuses on the next generation of fire-safe materials.

The development and availability of new fire retardant polymers has increased over the last ten years for various reasons. Especially promising for their fire retardancy are polymer nanocomposites (such as nanoclays), which

have distinct advantages over traditional fire retardants in production, amount of additive (only 2-5% compared with 20-70%) and recycling (simple clays). Concurrent work will enhance the fire retardancy and reduce fuel formation by promoting char formation using traditional fire retardants together with nanocomposites.

The major problem in the development of these materials is the absence of a fundamental methodology or tests to assess their flammability and burning behaviour in real-scale fires. Standard approval tests, which were adequate for halogenated fire retardant polymers, do not mirror the real-scale burning behaviour of polymer nanocomposites on a small scale. Conversely, micro-scale fundamental experiments are not sufficient to predict the fire behaviour of the materials.

PREFIRE is unique in that it focuses on the next generation of fire-safe materials, and brings together fire retardant and fire engineering expertise for the first time, allowing chemically intelligent approaches to polymer flammability to be applied to the problem of measuring nanocomposite flammability.

This project is expected to have an enormous impact within Europe, and especially in the accession states where fire deaths are still much too frequent, by increasing the fire safety of general consumer and building products, and by providing European industry with the know-how to meet the new stringent environmental and fire hazard regulations. The potential socio-economic impact of the outcomes of the proposed research is considerable. The substitution of halogenated flame retardants is a major issue that polymer producers will face in coming years as a consequence of the restrictions that will be introduced by the EU for these additives.

#### Role of University of Ulster in the PREFIRE project

The Institute for Fire Safety Engineering Research and Technology (FireSERT) at UU combines a multi-disciplinary team of scientists, engineers and psychologists in a unique laboratory facility in Ireland and within the Universities sector of the United Kingdom. Apart from overall coordination of the PREFIRE project, FireSERT will apply its products and tools in the area of fire dynamics and material flammability, as well as the Institute's experience in materials research and testing.

#### Benefits for University of Ulster of participating in this EU project

Professor Delichatsios told *focus on 6*: "Through this project, FireSERT will enhance its position as a centre of excellence for the design and evaluation of fire-safe materials by pursuing and achieving the following goals: understanding the burning behaviour of fire-retarded polymers; development of a new predictive technique for nanocomposite burning behaviour; and the development of

the next generation of environmentally sustainable fire-safe materials, based on polymer nanocomposites.

"The scientists and engineers involved in the project represent the best combination of available experts in the world. The consortium combines the fire retardant chemistry expertise of Europe's leading laboratories with Europe's leading fire safety engineers. This is the first time these two groups have set out to combine their expertise in order to model burning behaviour, and better understand the processes occurring. The project provides a valuable opportunity to work with fire retardant manufacturers and nanocomposite producers, including Europe's only manufacturer of a fire retarded nanocomposite product, a halogen-free fire retardant cable sheathing, currently selling hundreds of tonnes per year."

For further information, please contact:  
Professor Michael A. Delichatsios  
Chair in Material Flammability and Fire Dynamics  
Acting Director of FireSERT  
University of Ulster  
Tel: +44 (0)28 9036 8754  
E-mail: [m.delichatsios@ulster.ac.uk](mailto:m.delichatsios@ulster.ac.uk)  
Project Web: [www.engj.ulst.ac.uk/prefire/](http://www.engj.ulst.ac.uk/prefire/)