Reference Information

Reference is also made to the kick-off, 6-, 12-, 18-, 24-, 30- 36- and 42-month meeting information, including description of work, minutes and presentations, all of which have been issued to all partners and the European Commission.

0 Publishable Executive Summary

FLARETPOL, *Development of an innovative, cost-effective technology to produce halogen-free high performance flame-retarded polyolefins*, is a three year specific targeted research project carried out in the technology area "Nanotechnologies and nano-sciences, knowledge-based multifunctional materials, and new production processes and devices".

The project aims to produce advanced nanocomposites of polypropylene homopolymer and copolymers with surface treated micro- and nano-sized inorganic materials to imbue flame retardency to the polymer matrix while retaining the desired physical properties of the material. This removes the need to use toxic and environmentally hazardous materials and enables the development of materials functional at higher temperatures than existing materials for certain applications.

The contractors involved in the project are:

- Università degli Studi di Milano (Co-ordinator from 01.09.2006) Italy, **UMI**
- Dead Sea Bromine Compounds Ltd., Israel, **DSB**
- Perplastic SL, Spain, **PERPLASTIC**
- Laviosa Chimica Mineraria SPA, Italy, **LAVIOSA**
- Coficab Portugal – Companhia de Fios e Cabos Lda., Portugal, **COFICAB**
- Firat Plastik Kaucuk Sanayi ve Ticaret AS, Turkey, **FIRAT**
- Kunststofftechnik Sachsen GmbH & Co. KG, Germany, **KTSN**
- Leibniz-Institut für Polymerforschung Dresden, Germany, **IPF**

- Fundación Gaiker, Spain, **GAIKER**
- Rapra Technology Ltd., United Kingdom, **RAPRA**
- L'Urederra, Fundación para el Desarrollo Tecnológico y Social, Spain, **LUREDERRA**
- Polymer Laboratories Ltd. (from 01.04.2005 to 30.08.2006, Co-ordinator in the same period), United Kingdom, **POLYMER**
- Argus Chemicals s.r.l. (from 01.08.2006) Italy, **ARGUS**
- Lviv Polytechnic National University (from 01.11.2006) Ukraine, **LPNU**

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The **first** six-months of the project have involved investigation of competing materials and the setting up of detailed specifications of the products to be developed and definition of prototype materials to be replicated using the new technology by the end-user partners.

In addition, preliminary work on development of the surface treatment agents to be used for compatibilisation of the micro- and nano- fillers has been carried out and a range of materials have been identified for use in promotion of compatibilisation and property improvement of the matrix polymers.

In the **second** six month period work has been concentrated on research into the synthesis of Reactive Oligomers and their precursors together with investigation of the polymeric coating of magnesium hydroxide (MH) particles. Considerable effort has also been invested in determining baselines for the compounding of polyolefins with MH both with and without nanoclays alongside testing such baseline materials for mechanical and fire retardant properties.

In the **third** six month period work has been concentrated on research into the synthesis, preliminary tests of scale-up and characterisation of new Reactive Oligomers together with investigation of the polymeric coating of magnesium hydroxide (MH) particles. The research work on the determination of baselines for the compounding of polyolefins with MH both with and without nanoclays alongside testing such baseline materials for mechanical and fire retardant properties has proceeded.

In the **fourth** six month period work has been concentrated on research into the following areas: scale-up and characterisation of new Reactive Oligomers; investigation of the polymeric coating of magnesium hydroxide (MH) particles according to different routes on a larger scale; compounding of polyolefins with MH and nanoclays; mechanical and fire retardant testing of the blends obtained.

In the **fifth** six month period partners have carried on research into the synthesis of new monomers and Reactive Oligomers and the investigation of the polymeric coating of magnesium hydroxide particles according to different routes on a larger scale. The synthesis of MH particles of different sizes has also been carried on.

Compounding experiments of polyolefins with MH and nanoclays and mechanical and fire retardant testing of the blends obtained have lead to the selection of the best PP/MH-composite formulations based on the first envisaged route, namely blending with modified MH microparticles. Similar results are expected according to an alternative route based on the direct blending of MH, polymer matrix and modifier. The synthesis of Kg-scale batches of monomers and Reactive Oligomers has been planned.

The development of alternative processes for the industrial production of the peroxide containing monomer used as precursor of the Reactive Oligomers has been planned.

The best formulations for the industrial production of prototypes have been selected. Prototype production to achieve the project objectives has been

planned and assignments distributed among the industrial partners involved in prototype production.

In the **sixth** six month period research has mainly focused on the production of Kg-size batches of monomers and Reactive Oligomers for the industrial production of prototypes. Additional experiments on modification routes of MH according to encapsulation methods has also been carried on.

The production of prototypes based on clay nanofillers has been carried out.

In the **seventh** six month of the project work has involved the industrial production of prototypes, namely cables and automotive details, and the evaluation of their processability, mechanical performance, fire resistance. The techno-economical evaluation of the overall industrial process has also been assessment.

The recyclability of formulations and prototypes produced has been evaluated.

An alternative processes for the industrial production of the peroxide-containing monomer used as precursor of the Reactive Oligomers for MH modification has been established.

The feasibility of the industrial production of formulations, cables and automotive details has been assessed.