Nanostructured Toughened Hybrid Nanocomposites for High Performance Applications

Rendicontazione

Informazioni relative al progetto

NANOTOUGH

ID dell'accordo di sovvenzione: 213436

Sito web del progetto

Progetto chiuso

Data di avvio
1 Ottobre 2008

Data di completamento
30 Settembre 2011

Finanziato da
Specific Programme "Cooperation": Nanosciences, Nanotechnologies, Materials and new Production Technologies

Costo totale
€ 7 189 307,00

Contributo UE
€ 5 089 000,00

Coordinato da
AALBORG UNIVERSITET
Denmark

Questo progetto è apparso in...

Periodic Report Summary 2 - NANOTOUGH (Nanostructured toughened hybrid nanocomposites for high performance applications)

Publishable summary:

NANOTOUGH objectives and goals
NANOTOUGH is a European framework project that focuses on developing tough plastic materials using nanotechnology.

Nanocomposites are emerging new materials that promise improved properties, but in practice, it has been difficult to translate existing knowledge on nanotechnology into tangible products. NANOTOUGH's objective is, in addition to basic research, to remove the technical barriers so that nano-composite materials can be used commercially.

The basic objective is to obtain a deeper understanding of the interfacial structure of nanocomposites within a polyolefin matrix. This knowledge will enable realisation of the great performance potential of these materialise through development of novel multiphase and hybrid nanocomposites. This knowledge will facilitate commercialisation of polymer nanocomposite materials with superior properties that will lead to development of new products.

To meet this objective, we aim to improve the stiffness of polyolefin nanocomposites while not only maintaining but also improving the toughness of the matrix considerable. The technical objective is to optimise and, through novel interface design, to develop new cost effective hybrid (nanofiller-fibre) nanocomposites as an alternative to heavily filled polymers and expensive engineering polymers and fulfil industry requirements for high-performance materials in high-tech applications.

Project activities

WP1: Materials - interface design

A major activity in this work package is the synthesis and use of functionalised block co-polymers to induce and enhance the intercalation and exfoliation of nanoparticles in polyolefines and to improve their stiffness and impact strength.

WP2: Structure and composition analysis

State-of-the art characterisation techniques, like Focused ion beam-scanning electron microscope (FIB-SEM), high-resolution Environmental transmission electron microscopy (ETEM), Wide angle X-ray scattering (WAXS) and (Small angle X-ray scattering) SAXS are carried out to study the structures at nano-scale level particularly related to the interphase.

WP3: Flow and dispersion mechanisms:

The objective of this WP is to obtain increased knowledge on the effect of various parameters on dispersion process by means of rheological measurements including rheo-X-ray techniques

WP4: Properties at service conditions

The activity is concentrated on experimental analysis of the visco-elasto-plastic response of the nanocomposites, development of constitutive models for the mechanical behaviour of hybrid nanocomposites and analysis of the effects of filler (chemical structure, type, concentration) and compatibiliser (chemical structure, concentration, mixing conditions) on the mechanical behaviour of hybrid nanocomposites

WP5: Implementation

A major activity in this work package is preparation for productions tests using various compounding techniques. Furthermore, materials will be processed and shaped into selected automotive and aerospace parts.

WP6: Dissemination and exploitation of results
The work is concentrated on maximisation and early-stage exploitation of the project results and successful market implementation

WP7: Management:
Management of the project and coordination to other related research activities

Grafted nanoclays

Project outcomes:

So far, the outcomes of the project are improved models for nanocomposites, increase in several mechanical properties like stiffness, strength, creep resistance, impact properties and more. Furthermore, important knowledge has been gained concerning chemical modification and processing.

Perspectives
The perspective of the current work is to turn upside down the construction of a number of well-known products where metals or plastics are used today in cars or aircrafts. As an example, car components like spare wheel well and structural parts like bumper carriers are developed:
Spare wheel well

Structural part for bumper carrier

The NANOTOUGH Consortium

11 partners from Germany, France, Italy, Spain, Romania and Denmark are participating in the project.

1. Aalborg University, Denmark (coordinator)
2. Chemical Research Institute, Romania
3. University of Hamburg, Germany
4. Technical University of Denmark, Denmark
5. University of Genova, Italy
6. ARMINES-CEMEF, France
7. Centro Ricerche Fiat, Italy
8. The Danish Technological Institute, Denmark
9. Laviosa Chimica Mineraria, Italy
10. FPK S.A Spain
11. Aviospace, Italy

Contact details:
Coordinator: Prof. Jesper de Claville Christiansen
Aalborg University - Department of Production
Fibigerstræde 16
9220 Aalborg E
Denmark
Phone +45 9940 8970
E-mail jc@production.aau.dk
Website: www.nanotough.aau.dk

Ultimo aggiornamento: 5 Luglio 2012

Permalink: https://cordis.europa.eu/project/id/213436/reporting/it