SYNERGIC COMBINATION OF HIGH PERFORMANCE FLAME RETARDANT BASED ON NANO-LAYERED HYBRID PARTICLES AS REAL ALTERNATIVE TO HALOGEN BASED FLAME RETARDANT ADDITIVES

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under Grant Agreement n° 310187

NMP.2012.2.2-5
GA n° 310187

Updated January 2013

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PHOENIX Fact Sheet

- Title:
  - "Synergic combination of high performance flame retardant based on nano-layered hybrid particles as real alternative to halogen based flame retartant additives"
- Starting /ending (duration):
  - January 2013 / December 2016 (48 months)
- Funding:
  - This project is funded under the European Seventh Framework Programme Theme NMP.2012.2.2-5, Halogen free flame retardant materials
- Budget:
  - € 6,981,368.80 (EC Contribution € 5,099,936)
- Consortium:
  - 15 Partners from 8 countries

Background

- Halogen Flame Retardants (HFR):
  - Low price
  - Give flame retardant properties without decreasing mechanical properties (do not decrease impact strength)
  - High efficiency (15% w/w)
  - Environmental problems:
    - Furans and dioxines are generated during combustion

Background

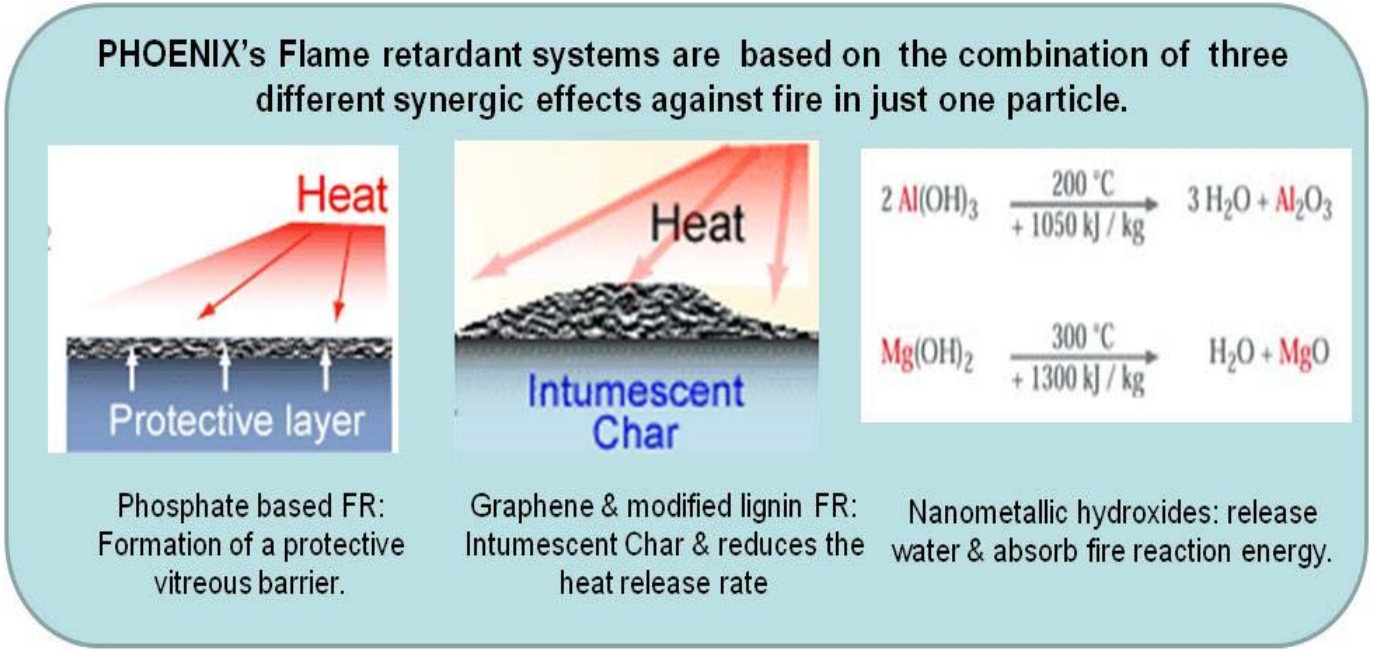
- Halogen-Free Flame Retardants (HFFR):
  - Non toxic and environmental friendly
  - High filler loadings are required (40-60%) to achieve good fire resistance:
    - Higher cost
    - Processing problems
    - Decrease of mechanical properties (low impact strenght)

Background

- Phoenix Flame Retardants:
  - Highly efficient halogen free flame retardants based on nanoparticles combination (Low % and price)
  - Environmental friendly
  - Good processability
  - Good mechanical properties

PHOENIX Concept

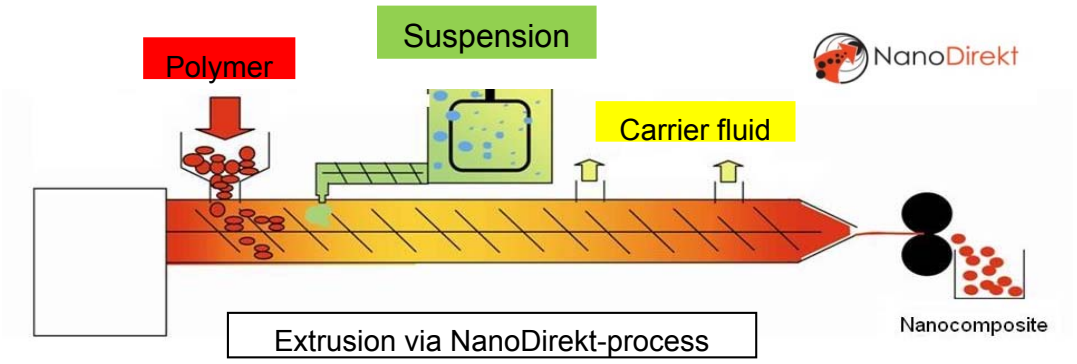
- Develop new halogen free FR nanostructured materials based on nanolayered structures produced using innovative green chemical routes and modified lignins.

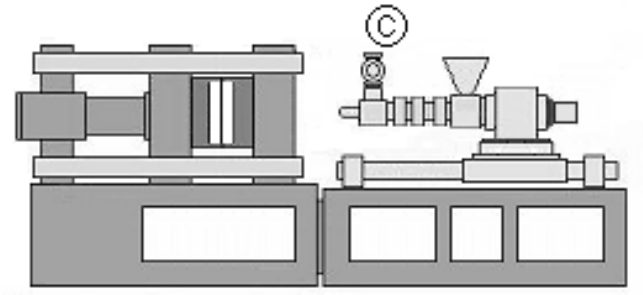


Self-assembly technology → nanoplatellets structures

PHOENIX Concept

- Innovative processing routes to optimize nanocomposites properties:
  - New compounding techniques: Nanodirekt process
  - Ultrasounds mixing systems to improve nanoparticles dispersion during extrusion and injection moulding

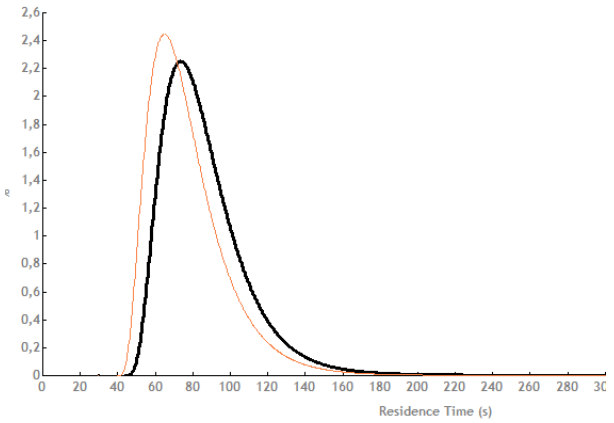


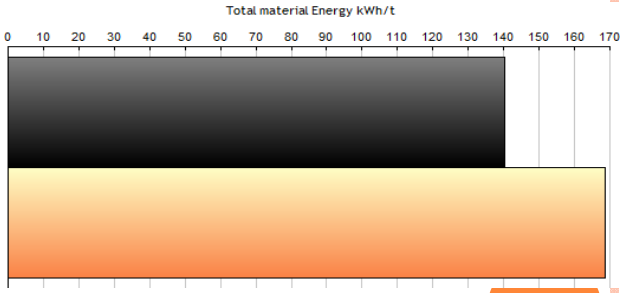


Combined US nozzle on injection moulding machine

PHOENIX Concept

- Simulation and modelling of compounding process in order to optimize nanoparticle dispersion





Objectives

1. Produce sustainable FR nanoparticles: water-based production methods
2. Self assembly technology will be used to functionalize nano-layered FR particles and produced ordered nanostructures.
3. Develop FR additives from renewable sources based on lignins modified by boron and phosphorous reagents to improve RF properties.
4. Reduction of FR content up to 15%w/w
5. Nanoparticles dispersion improvement during compounding applaying NanoDirekt process

Objectives

6. Develop a new module for LUDOVIC compounding simulation software in order to optimize FR nanocomposites dispersion
7. New FR compounds with good processability employing conventional extrusion and injection moulding machines or assisted by ultrasound devices to improve nanoparticle dispersion
8. Competitive cost: less than 20% increase over halogen FR.
9. Study co-extrusion and co-injection processes to decrease the FR content and achieve good mechanical properties. (functional layer + structural layer)

Objectives

10. Develop stable epoxy pre-pregs containing FR nanoparticles
11. Increase in a 10% the mechanical and thermal properties of the new FR compounds compared to halogen FR materials
12. Fully recyclable compounds (up to 30% will be added to the virgin polymer decreasing mechanical properties less than 10%)
13. Develop a methodology for a quick in-line test to evaluate FR resistance
14. Positive environmental impact
15. Materials selection will take into account technical, performance, health, environmental and economic factors

Partners


PHOENIX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Applications and Markets

1. Electrical / Electronic Devices (E&E)
2. Low-voltage wires
3. Household appliances

White goods

electric motor connectors

Cable industry

For more information

- www.phoenix-eu-project.eu:
  - Project objectives
  - Partners
  - News – Dissemination activities
  - Technological watch (technical information related with halogen, flame, fire, resistance, nanomaterials)
- Project coordinator:

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