

Research Programme on Sustainable Production and Products (KETJU); Academy of Finland

Annual report 2008

Design of novel non-halogenated flame retardants – combustion and polymer scientists join forces

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Project title: Design of novel non-halogenated flame retardants –
combustion and polymer scientists join forces

Responsible project leader: Professor Carl-Eric Wilén

Resources:

**Laboratory of Polymer Technology, Åbo Akademi
University**

M.Sc. Melanie Aubert

M.Sc. Weronika Pawelec

M.Sc. Teija Tirri

Prof. Carl-Eric Wilén

Process Chemistry Centre, Åbo Akademi University

M.Sc. Johan Lindholm,

Dr. Anders Brink,

Prof. Mikko Hupa

Updated research aims:

Our intent is to develop jointly further the family of novel azoalkane fire-retardants and above all to create a base for constructing a novel tool-box that will be helpful in rendering any polymeric material fire retardant. Our approach will be based on synthesis of novel model flame retardant compounds, new fire test methodologies, new techniques for evaluating results, including mathematical modeling and simulation that will further increase our knowledge in fire retardancy theory and applications.

Results (publications, patents, conferences, etc.)

Publications:

1. Aubert, Melanie; Weronica Pawelec, Roth, Michael; Pfaendner, Rudolf; Wilen, Carl-Eric "Structure property relationship between azoalkane and flame retardancy efficacy, to be submitted to Journal of Polymer Science Chemistry Edition.
2. Aubert, Melanie; Weronica Pawelec, Roth, Michael; Pfaendner, Rudolf; Wilen Carl-Eric, "A new flame retardant X for polyolefins" to be submitted for publication after filling of patent application.

Patents:

Roth, Michael; Pfaendner, Rudolf; Wilen, Carl-Eric; Aubert, Melanie. **Symmetric azo compounds in flame retardant compositions.** PCT Int. Appl. (2008), 31pp, WO 2008101845 A1 20080828 CAN 149:308637 AN 2008:1040512

Conferences:

Invited speaker:

1. Lindholm, J., Brink, A., and Hupa, M., "Cone Calorimeter – A Tool for Measuring Heat Release Rate", Topical Meeting on Measuring Techniques in Combustion, 23-24.10, Gothenburg, Sweden, 2008
2. Mélanie Aubert Weronika Pawelec Rudolf Pfaendner and Holger Hoppe and Carl-Eric Wilén^{1*} **Multifunctional flame retardants based on azoalkanes**, accepted as an oral presentation at the 12th European Meeting on Flame Retardant polymers, Poznan University, Poland.

Impact of research activities (visits, interviews, other activities)

Initiation of collaboration with professor Vuorinen at Tampere University of Technology within the framework of FIRECO and novel flame retardants for thermoset polymers.

Interest of companies towards the research project:

Numerous domestic and international companies have shown interest towards the flame retardant research project. Among other things a two year project has been started with Kiilto Oy in order to develop environmentally friendly flame retardants for polyurethane based glues.

Research progress in regard to original plan:

The research has progressed according to aims set forth in the original research plan. Thus, we have successfully prepared new flame retardant compounds and gained a better understanding of structure property relationship of azoalkanes and their efficacy as flame retardants. To our great delight some of the new azoalkanes that simultaneously exhibit excellent flame retardant properties with light stability are under evaluation of being commercialized by Ciba Specialty Chemicals, Switzerland.

In addition, a cone calorimeter for measuring heat release as a function of time has been set up and taken into use.