Univ.-Prof.
Prof. h.c. (Moscow State Univ.)
Dr.-Ing. Dipl.-Wirt. Ing.
Thomas Gries
Institutsleiter

Martin Pelzer
Wissenschaftlicher Mitarbeiter

Mein Zeichen: MP
15.05.2019

Project titel:	Development and investigation of new flame retardants based on phosphoric acrylates and methacrylates as additives for aliphatic polyamide fibres (PA) - FlamPAFas
Partners:	Fraunhofer-Institut für Betriebsfestigkeit und Systemzuverlässigkeit (LBF)
Duration:	03/2019 – 02/2021
Funding:	Forschungskuratorium Textil e.V. (FKT)

Mission Statement:

Textile products are present in almost all areas of public and private life. The majority of textiles are made of synthetic polymer fibres. Synthetic fibres made of polyamide are the second largest group, accounting for 11 % of global filament yarn production after polyester, which accounts for 82 %. Polyamide fibres are mainly used for applications in which polyester yarns cannot be used due to their inadequate properties. Both polymer fibers are highly combustible without suitable flame retardants. In order to reduce the high risk of fire, there are various regulations that prescribe the use of flame retardant substances for textile products.
For this reason, research has been carried out for several decades into the development of flame retardants for synthetic polymer fibres. While flame retardants for polyester fibres are already available on the market (e.g. Trevira CS by modifying the chemical structure of the polyester), it has not yet been possible to develop a marketable thermoplastic flame retardant for fibres made of pure polyamide 6 (Perlon) or polyamide 6.6 (Nylon), which can be added as an additive to the polymer melt prior to fibre spinning. The particle-like flame retardants for PA available on the market are unsuitable for fiber applications because they do not achieve sufficient flame retardant and fiber properties.

Approach:

The aim of the project is to develop a polymer-based flame retardant for the production of intrinsically flame retardant polyamide fibres. The intrinsic flame retardancy of polyamide fibers currently poses a major challenge. This is caused by the particle-like character of the flame retardants, since the addition of non-melting additives in the melt spinning process leads to brittle fibers. This is due to on the high stress and strain increase at the particle-polymer interface. This prevents a high orientation of the polymer chains, which is crucial for good mechanical fiber properties. Furthermore, instabilities in the melt spinning process (filament breaks, short nozzle lifetimes) and an increase in surface roughness are to be expected. Surface roughness has a negative influence on abrasion resistance. These deficits are to be solved by a morphology as fine as possible and by an improved phase bond between the polyamide matrix and the flame retardant.

The aim is to introduce functional groups into the flame retardant that have a high affinity for polyamide or ideally can react with the chain ends of the polyamide. Graft copolymers are expected to form at the interface, reducing the interfacial tension between the two components and ensuring optimum compatibility between the two polymers.

Contact:

Martin Pelzer, M.Sc. M.Sc.
Technical Fiber Division
Otto-Blumenthal-Str. 1
52064 Aachen
Fon: +49 (0)241 80 23468
Email: martin.pelzer@ita.rwth-aachen.de