

Toxic flame retardants are a burning issue

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Credit: European Cooperation in Science and Technology (COST)

Flame retardants are an integral part of creating products from plastics to textiles that are fire friendly. However, many of the flame retardants in use are toxic and damaging for the environment. Dr. Giulio Malucelli has built a group that is 'greening-up' flame retardant chemicals.

The use of flame retardants is growing by a rate of nearly 5% a year, and by 2018 the market is expected to be worth USD \$7 billion. They are a vital part of modern life, but they pose problems around health, safety and the environment. So one researcher reached out to the COST Programme to help in his quest to address these issues by sharing knowledge and ideas with experts in this field.

There are dozens of materials that various industries have used as flame retardants historically. However, the ones receiving the most attention from Dr. Giulio Malucelli, Associate Professor of Materials Science and Technology at Polytechnic University of Turin, are those used by the [textile](#) industry.

Dr. Malucelli's interest in flame retardants grew out of his activities in chemistry and chemical engineering. Drawn to the field through his investigations into polymers, Dr. Malucelli noticed that while extremely useful to society from an industrial and construction perspective, using flame retardant chemicals presented concerns over meeting fire safety requirements. The use of biomacromolecules instead of chemicals in flame retardants could be a safer option.

Furthermore, he also discovered that many of the flame retardants used by the textile industry can cause grave damage to the environment. "Some of the standard flame retardants can have a high environmental impact and usually require complex and expensive technologies for their application to textiles" he notes.

In 2014, Dr. Malucelli approached the COST Programme with the goal of building an international, multidisciplinary group dedicated to solving the issues currently plaguing industry's use of flame retardant chemicals. The result was the COST Action FLARETEX—Sustainable flame retardancy for textiles and related materials based on nanoparticles substituting conventional chemicals.

"The objective of FLARETEX was to create a network dedicated to fire retardant issues related to textiles – both natural and synthetic – and develop new innovative flame retardants with low fire toxicity and environmental impacts that were also halogen-free," says Dr. Malucelli.

His own activities within FLARETEX have zeroed in on designing and developing biomacromolecules (namely, proteins and nucleic acids) as flame retardant systems for textiles. "We succeeded in proposing and publishing papers on biomacromolecules as low impact, sustainable and effective flame retardants for cotton fabrics, PET and their blends" he states.

"The COST Action has also helped disseminate the research carried out by my group. Some of the results are being acted up in a H2020 project on the recovery and use of biomacromolecules from wastes for conferring flame retardant properties to bio-polymers."

Dr. Malucelli and his team also worked with production finishing company INOTEX, successfully testing a new ecofriendly, water-based halogen and antimony-free flame retardant. It performed well when compared to conventional [flame](#) retardant coating systems, and the advantages of its more eco-friendly nature has led to a significant uptake within the industry.

According to Dr. Malucelli, the COST FLARETEX Action was also created with the intention of encouraging researchers to propose and discuss new solutions to tackle the problems emerging from the use of standard [flame retardants](#) – a goal it has succeeded in achieving.

"The scientific and technological network that we created during the COST Action included several people with high competencies, straddling different 'areas' within the textile world" he shares. "The obtained results clearly demonstrate the high level of competency within

the network."

Provided by European Cooperation in Science and Technology (COST)

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