CYCLE DE CONFÉRENCES DE CHIMIE

Avec le concours de : Université Clermont Auvergne
SIGMA Clermont

Jeudi 16 mai à 16 h

Amphi Rémi (site des Cézeaux)

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Using bio-based resources for the flame retardancy of polymers

For fire safety reason, flame retardancy is a key requirement in many applications involving polymers (transport, building, cables…) and flame retardants (FRs) are the first class of additives from a turnover point of view. In the prospect of promoting environmentally friendly polymers, there is a necessity to develop new flame retardants which contribute to this goal. One way that has roused a great interest over the last five years consists in using bio-resources as raw matter for flame retardants. Several benefits are anticipated: (i) reduction of oil-based products, (ii) substitution of flame retardants exhibiting health concern, (iii) specific FR effects related to bio-resources chemical structure.

After reminding some basics on polymer combustion and the different strategies for their flame retardancy, the lecture will present recent examples of flame retardants developed from the different components of biomass (polysaccharides, proteins, polyphenols, lipids). A particular focus will be made on bio-phenolic derivatives that roused our interest in the recent years. Different studies highlighted that lignin, the most abundant phenolic natural polymer, exhibits positive effects on the fire behaviour of polymers. The main mode of action that was evidenced is related to the promotion of a charred residue that decreases the amount of fuel and acts as thermal shield that protects the underlying polymer. Attempts have been made to prepare chemically modified lignin in order to emphasize its charring ability. It was shown also that simple bio-phenolic compounds can also be used as building blocks to design new fire-safe polymers with a better control of chemical modification. Hence fire retardants, that can be either additive or reactive, were developed from phloroglucinol after phosphorylation and/or glycidylation and used in epoxy resin. A spectacular intumescent behavior was observed. More recently boron modified chestnut tannins were also prepared and assessed for their fireproofing properties.

As a conclusion to the lecture, the future of bio-based FRs will be discussed evoking their advantages but also obstacles than may hinder their development.

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