Lignin depolymerization and upgrading towards sustainable acrylic based materials

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Aromatics, which constitute approximately 40% of the resources for the chemical industry, are currently predominantly derived from petroleum. Some of these aromatic building blocks raise toxicity concerns, such as bisphenol A. Environmental and climate urgencies are forcing the polymer industry to seek more sustainable raw materials. In this framework, the use of raw materials derived from biomass is rapidly increasing, because the availability of cheap fossil raw materials has already a foreseeable limit as crude oil is being depleted.

The synthesis of (semi)aromatic polymers derived from renewable resources is currently attracting tremendous interest from both academia and industry, as aromatics are key intermediates in the manufacturing of chemicals and polymers. Lignin, the second most abundant natural polymer on earth after cellulose, is the only large-scale source of aromatics in nature. Despite the potential of lignin in the development of new polymers, its intrinsic complexity and heterogeneity and recalcitrance have limited its widespread use in specialty materials.

This presentation will highlight various strategies being developed to facilitate the use of lignin in acrylic-based applications, with a special emphasis on the work conducted at the Flemish Institute for Technological Research (VITO). The presentation will address three specific aspects: i) the depolymerization and valorisation of lignin towards functional bio-aromatic fractions, ii) the acrylic functionalization of lignin fractions and its derived molecules. iii) the use of these lignin fractions as building blocks for the synthesis of new acrylic polymers and derivatives.