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Brigitte Chabbert, Gabriel Paës, Véronique Aguié-Béghin

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Registrant's email: chabbert@reims.inra.fr

DESIGNING BIO-INSPIRED POLYMER ASSEMBLIES TO UNRAVEL LIGNOCELLULOSES PROPERTIES

Brigitte Chabbert[a,b], Gabriel Paës[a,b], Véronique Aguié-Béghin[a,b]

[a]INRA, UMR 614 FARE, F-51000 Reims, France,
[b]University of Reims Champagne-Ardenne, UMR 614 FARE, F-51000 Reims, France

Lignocelluloses represent abundant resources for the production of biofuels, industrial-relevant chemicals as well as the usual fibers and wood derived products. Notably, the lignified plant cell walls are composite materials resulting from the assembly of different biopolymers (cellulose, hemicelluloses and lignin). These components are interconnected through a variety of covalent and non covalent interactions giving rise to a highly organized network. Owing to the large complexity and variability of the lignified cell walls, unraveling the molecular and supramolecular mechanisms that give rise to the physicochemical properties and reactivity of the lignified cell walls is still challenging.

Building macromolecular assemblies that mimic plant cell wall can provide information not only on the main events responsible for the construction and properties of plant cell wall, but also on the mechanisms involved in resistance towards enzymatic or physicochemical deconstruction [1,2,3]. This presentation will report on experimental approaches to address molecular /supramolecular reactivity of lignin, hemicelluloses cellulose nanocomposites with regards to recalcitrance and cohesiveness of native lignocellulosic cell walls.

[1] Barakat A, Winter H, Rondeau-Moureau C, Saake B, Chabbert B, Cathala B. Studies on xylan interactions and cross-linling to synthetic lignins formed by bulk and end wise polymerization: a model study of lignin carbohydrate complex formation. *Planta***,** 2007, 226: 267-281.
[2] Boukari I, Putaux, JL, Cathala B, Barakat A, Saake B, Remond C, O'Donohue M, Chabbert B. In vitro model assemblies to study the impact of lignin-carbohydrate interactions on the enzymatic conversion of xylan. *Biomacromolecules*, 2009, 10: 2489-2498
[3 Beaugrand J, Paës G, Reis D, Takahashi M, Debeire P, O'Donohue. MJ, Chabbert, B. Probing the cell wall heterogeneity of micro-dissected wheat caryopsis using both native and inactive forms of a GH11 xylanase *Planta*, 2005, 222: 246-257.