Researchers involved in the project BIOPSIL funded by ANR are: Dr. Isabelle Dez, Pr. Annie-Claude Gaumont, Dr. Eric Guibal and Thierry Vincent. BIOPSIL project was carried out by: Nathalie Clousier (PhD funded by ANR), Claire Jouannin (PhD funded by ANR), Renaud Moucel (PhD) and Dr. Prashant Naik (Post-doc).

Combining advantages of homogeneous catalysis (high activity and selectivity) with those of heterogeneous catalysis (easy product/catalyst separation, recycling and reuse of the catalyst) is a high interest for economical and ecological points of view.

Our aim was to develop innovative and sustainable catalytic materials by the immobilization of a transition metal catalyst in an ionic liquid (IL) phase supported on a biopolymer.

Our BioPSIL (BioPolymer Supported Ionic Liquid) materials were prepared from two marine polysaccharides, alginates and chitosan, using two strategies.

First method: confinement of the IL

Porous BioPSIL materials were prepared in the form of cylindrical monoliths, discs or beads.

The BioPSIL were characterized and successfully applied for the Pd-catalyzed hydrogenation of 4-nitroaniline and nitrophenol in aqueous solution, with complete conversions in 15 min and conversions of 93% after 4 days in continuous flow systems.

This study showed the influence of the nature of the biopolymer support and the nature of the IL on textural properties of the BioPSIL materials and on their catalytic activity.

Second method: adsorption of the IL

BioPSIL materials (beads or scaffolds) were successfully applied for the Pd-catalyzed allylic substitution reaction of allylic acetate or allylic alcohol.

BioPSIL were proved to be compatible in basic or acidic conditions used to performed the reactions. BioPSIL materials provided high activities and recyclability up to 10 cycles. Both the nature of the biopolymer support and its conditioning influence the BioPSIL materials catalytic properties.

Project outcomes

BioPSIL were proved to be compatible with both Pd-catalyzed reactions, stable in the reaction conditions and reusable. They lead to low leaching of Pd and should be efficient in continuous flow processes.

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