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Chemical depolymerization of lignin in ionic liquids

Kei Saito, Sepa Nanayakkara and **Antonio F Patti**
Monash University, Australia

Lignin is one of the most abundant renewable materials on earth and it has the potential to yield valuable chemicals by depolymerization. Despite its unique characteristics as a natural product with multiple chemical and biophysical functionalities, it is largely under-exploited, because of the lack of available methods that effect depolymerization in a selective manner. The research community has investigated different strategies to depolymerize lignin, however, there are drawbacks for most existing methods such as the need for high temperature and high pressure. There are no reports focused on chemical depolymerization of lignin involving the redistribution mechanism which can, in principle, be carried out under much milder conditions. The focus of our research is on depolymerization of lignin involving the redistribution mechanism with phenols under oxidative conditions in the presence of a metal catalyst in green solvents, especially in ionic liquids. The redistribution mechanism is one of the pathways in the oxidative polymerization of phenols, in which the aryl ether bond formed between phenols can dissociate under oxidative conditions to build the polymer chains. This reaction is known to be a reversible equilibration reaction and by considering the equilibrium of the redistribution mechanism in the polymerization, it has been found that depolymerization is likely to occur simultaneously by adding phenol compounds to poly (phenylene oxide) under oxidative conditions. As lignin has a similar aryl ether structure in their networks, we have used the redistribution mechanism to depolymerize lignin in ionic liquids.

Biography

Kei Saito is currently working as a Lecturer (teaching and research academic) of Chemistry at the School of Chemistry, Faculty of Science, Monash University. Before joining Monash University, he was a Visiting Research Associate at the Graduate School of Science and Engineering and at the Faculty of Science and Engineering at Waseda University, Japan for a year and he was a Postdoctoral Fellow at the Centre for Green Chemistry, University of Massachusetts Lowell, USA for 2.5 years. He received his BE (2000), ME (2002) and PhD (2004) degrees from Waseda University, Japan.

kei.saito@monash.edu