# NEW FINE CHEMICAL BUILDING BLOCKS FROM LIGNIN VIA STABILISATION OF REACTIVE INTERMEDIATES FROM THE C-2 ACIDOLYSIS PATHWAY

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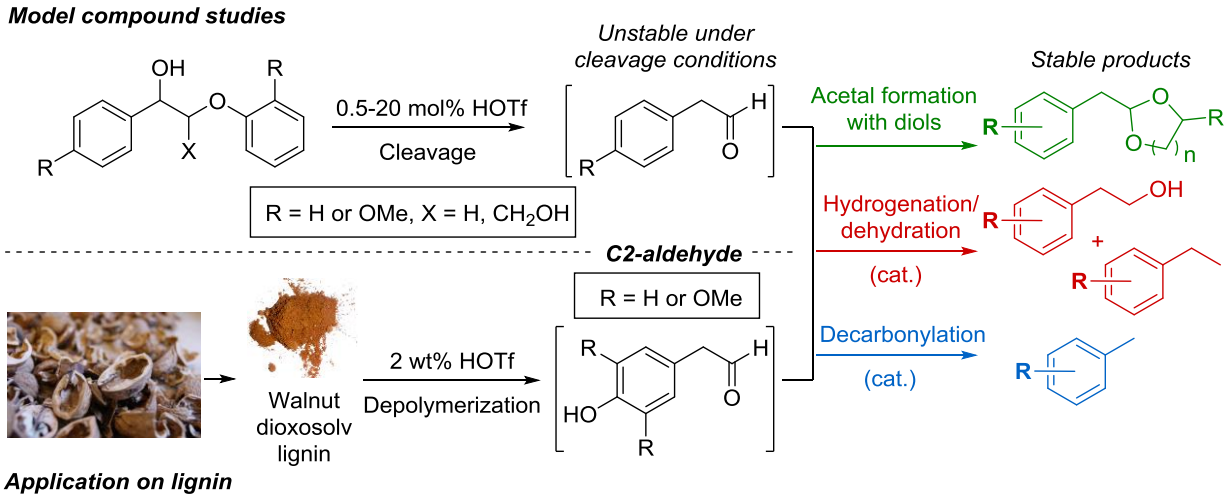
The looming shortage of fossil raw materials necessitates a gradual conversion to the production of chemicals from biomass. Whereas in the past decades great progress has been made in the efficient conversion of sugars into chemicals, the same cannot be said for lignin, the other half of lignocellulose. Although many methods have been developed for the depolymerisation of lignin, the reaction conditions that are used tend to lead to recondensation of the formed fragments and only poor yields of a multitude of monomeric compounds can be obtained. We have reexamined the acid catalyzed cleavage of lignin, starting from simple model compounds. We have found that using low concentrations of TfOH at 140 °C these model compounds are converted into (methoxylated) phenylacetaldehyde and guaiacol. However, the phenylacetaldehyde formed rapidly degrades under these conditions. We have developed three different strategies to control this decomposition. In one approach we add diols to form the acetals that are stable under the reaction conditions. In a second approach we do an in situ hydrogenation of the formed aldehyde to the 2-phenylethanol. Depending on the reaction temperature, this compound may dehydrate to the styrene which is hydrogenated to the ethylbenzene. At even higher temperatures, this compound is hydrogenated to the ethylcyclohexane. In the third approach we add a homogeneous iridium catalyst that decarbonylates the aldehyde to the (methoxylated) toluene. All these reactions occur in surprisingly high yields. Best of all, this chemistry also functions on lignin itself. Using any of the three approaches we see an increase in the size of the soluble fraction when compared to TfOH treatment alone. In addition, using GC-MS we were able to show that the major products of these reactions are indeed the expected acetals, alcohol or toluenes.

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