Catalytic deoxygenation of alcohols and ketones promoted by a new scandium / hydrosilane system

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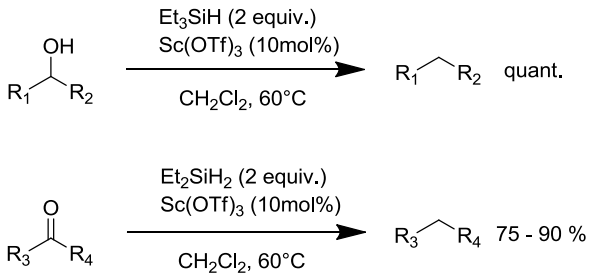
The rarefaction of carbon fossil resources calls for the use of alternative raw material sources for the production of fuels and chemicals. In this context, biomass waste constitutes a renewable source of carbon and is considered one of the most promising feedstock to the sustainable production of chemicals, [1] both from an economic and environmental standpoint. Nevertheless, molecules derived from biomass present a higher degree of functionalization than petrochemicals and they possess numerous oxidized groups, such as alcohols, carbonyls, ethers, etc. The selective reduction and deoxygenation of C-O and C=O bonds is thus a challenge to benefit from biomass derived products.

It is well established that hydrosilanes are suitable reagents for the reduction of alcohol and carbonyl group under mild conditions, in the presence of a Lewis acid catalyst. [2] Recently, our group has elaborated a process for the reductive depolymerization of lignin to isolate pure aromatics from different wood species. [3] This process is based on the reduction of ether functions in lignin with hydrosilanes (namely Et_3SiH) using $B(C_6F_5)_3$ as a catalyst. Seeking more robust and cost efficient catalysts, we have investigated the behavior of rare-earth elements catalysts in the hydrosilylation of alcohols, ethers and ketones. For the time, we have shown that rare-earth elements can promote the hydrosilylation of C-O and C=O bonds. In particular scandium triflate, $Sc(OTf)_3$, is an efficient catalyst for the reduction of alcohols and ketones to alkanes at 60 °C, in the presence of hydrosilanes. [4]



Scheme. Reduction of alcohols and ketones into alkanes.
(R_1, R_2 = aryl or alkyl ; R_3, R_4 = aryl, alkyl or H)

References

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