

Hydro-Alkylation of Unsaturated Fatty Compounds

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The alkylation of long-chain unsaturated fatty compounds is of great importance because alkyl branched oleochemicals have interesting properties. They are used for many applications such as lubricants, cosmetics, softeners, defoamers and wood-protecting agents. The ethylaluminum sesquichloride ($\text{Et}_3\text{Al}_2\text{Cl}_3$)-induced Friedel-Crafts alkylation using alkyl chloroformates is an interesting method for the hydro-alkylation of unsaturated fatty compounds.¹

The reaction of e.g. oleic acid with isopropyl chloroformate gave, mediated by $\text{Et}_3\text{Al}_2\text{Cl}_3$, after a reaction time of 2h, an approximately 1:1 mixture of the regioisomers 9- and 10-isopropyloctadecanoic acid in a yield of 72%.

In the presence of $\text{Et}_3\text{Al}_2\text{Cl}_3$ isopropyl chloroformate decomposes by formation of CO_2 and the isopropyl cation, which adds to the C,C-double bond of the fatty acid. Transfer of a hydride ion from $\text{Et}_3\text{Al}_2\text{Cl}_3$ to the adduct carbenium ion gives the saturated product. In some cases as, e.g., in hydro-alkylations of 10-undecenoic acid addition of a hydride donor such as triethylsilane was necessary. With respect to the wide spectrum of applications for alkyl-branched fatty compounds, it should be of interest to find more simple reaction conditions to perform the hydro-alkylation. First results with Lewis acids which can be handled more easier than alkyl aluminium halides such as FeCl_3 are discussed.

¹ U. Biermann, J. O. Metzger, *J. Am. Chem. Soc.* **2004**, *126*, 10319-10330.