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Low-temperature reduction of acyclic carvomentholactone derivatives with diisobutylaluminum hydride in methylene chloride

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Abstract

Earlier, we discovered a novel reaction in the chemistry of organoaluminum compounds - the formation of O-isobutyl acetals during low-temperature (-70 °C) treatment of a number of seven-membered lactones with a twofold (or more) molar amount of diisobutylaluminium hydride in methylene chloride. In addition, it was shown that the acyclic derivatives of (-)-mentholactone - methyl 6-hydroxy-3,7-dimethyl-octanoate and its 6-oxo analogue - also enter into the low-temperature reduction reaction of diisobutylaluminum hydride in methylene chloride. Moreover, methyl 6-hydroxy-3,7-dimethyloctanoate in this reaction behaves similarly to (-)-mentholactone: when 4 equivalents of diisobutylaluminium hydride acts on it, the reaction proceeds with the predominant formation of isobutyl acetal as the only (2*S*,7*S*)-epimer. Methyl 6-oxo-3,7-dimethyl octanoate in a low-temperature reduction reaction with 4 equivalents of diisobutylaluminium hydride in methylene chloride acts as a mixture of (-)-mentholactone and isomentolactone, leading to a mixture of (2*S*,7*S*)-, (2*S*,7*R*)- and (2*R*,7*R*)-isobutyl acetals in a ratio of 3.2: 1.3: 1.0, respectively. In the present work, when low-temperature reduction was involved in the reaction with diisobutylaluminium hydride, methyl (3*R*)-6-hydroxy- or (3*R*)-6-oxo-3-isopropylheptanoates available from carvomentolactone reacted without the formation of isobutyl acetal: a mixture of (2: 1) 6-hydroxy-(3*R*)-isopropylheptanal and (4*R*)-isopropyl-7-methyloxepan-2-ol was obtained.

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