Lithiation–Borylation of Secondary Alkyl Benzoates

Significance: Against common wisdom, Aggarwal and co-workers have now shown that secondary 2,4,6-triisopropyl benzoates (TIP esters) can be deprotonated at –60 °C using a combination of s-BuLi and TMEDA in cyclopentyl methyl ether (CPME). The resulting lithium reagents were allowed to react with various neopentyl boronic esters which after 1,2-metalate rearrangement and oxidation furnished a range of tertiary alcohols in good enantioselectivity.

Comment: This lithiation reaction cannot be performed in THF. Simply switching from THF to diethyl ether increased the yield of the lithiated benzoate. The extent of lithiation was increased further by using CPME. Interestingly, the subsequent borylation reaction occurs with complete retention of configuration.

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TIB = 2,4,6-trisopropyl benzoate
CPME = cyclopentyl methyl ether
R1 = CH2Bn, (CH2)2CHCH2, (CH2)3OTHP
R2 = Me, Et
R3 = Et, iPr, Ph, allyl, 3-(2-fluoropyridyl), (CH2)2CO2Bu, CHCHCH3
(R4)2 = pin, neo, Et2

Selected examples:

- 80% yield er = 99:1
- 78% yield er = 99:1
- 77% yield er = 99:1
- 78% yield er = 99:1

- 73% yield er = 99:1 (TMSCl was added after ate complex formation)
- 69% yield er = 98:2 (MeOH was added after ate complex formation)
- 72% yield er = 99:1
- 74% yield er = 99:1