Isomerisation of Alkenes Bearing Stannyl and Boryl Groups at the C=C Bond

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Z. Naturforsch. 57 b, 1251–1255 (2002); received August 14, 2002
Boron, Tin, Alkenes, Isomerisation, NMR Data

Alkenes bearing organometallic substituents such as boryl and stannyl groups isomerise slowly in the absence of UV irradiation. In addition to cis/trans isomerisation the boryl and stannyl group may also exchange places. This is shown for (Z)-2-chloro(dimethyl)stannyl-3-diethylboryl-pent-2-ene 5b (conversion into (Z)-3-chloro(dimethyl)stannyl-2-diethylboryl-pent-2-ene 7b) and 3,4-diethyl-1,1,2,5-tetramethyl-1,2-dihydro-1,3-stannaborole 8b (conversion into 3,5-diethyl-1,1,2,4-tetramethyl-1,2-dihydro-1,3-stannaborole 9b). Zwitterionic structures, involving a bridging boryl group with π-σ delocalisation, the stabilising effect exerted by a stannyl group in β-position with respect to a positively charged centre, and migration of a stannyl group, are suggested in order to explain the isomerisation. The heterocycle 9b was prepared independently from the reaction of 7b with lithium diisopropylamide.