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CARBON-CARBON BOND FORMATION BY ADDITION OF σ-RADICALS TO ALKENES

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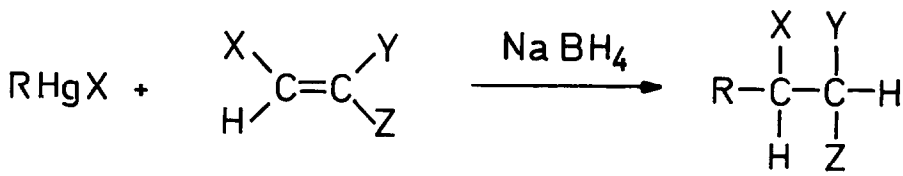
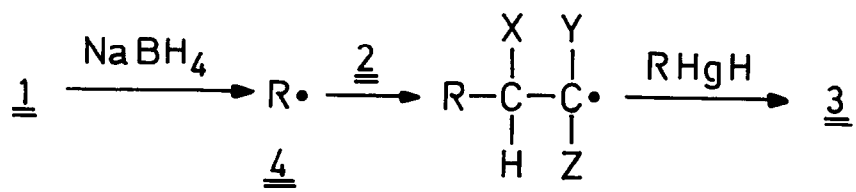
Summary: Cyclopropylmercury bromide and 7-norbornylmercury bromide, respectively, react with $NaBH_4$ and alkenes 2 via σ-radicals 6 and 7 to yield products 9 and 11 by carbon-carbon bond formation.

Reductions of alkylmercuric salts 1 with $NaBH_4$ in the presence of electron deficient alkenes 2 yield products 3 in a carbon-carbon bond formation reaction[1]. These syntheses occur via alkyl radicals 4[1,2] that attack alkenes 2 to give adduct radicals 5. Trapping of 5 with RHgH as H-donor leads to reaction products 3. We have now shown that this "mercury-method" can also be applied to systems in which the pyramidal σ-radicals 6[3] and 7[4] are the intermediates[5].



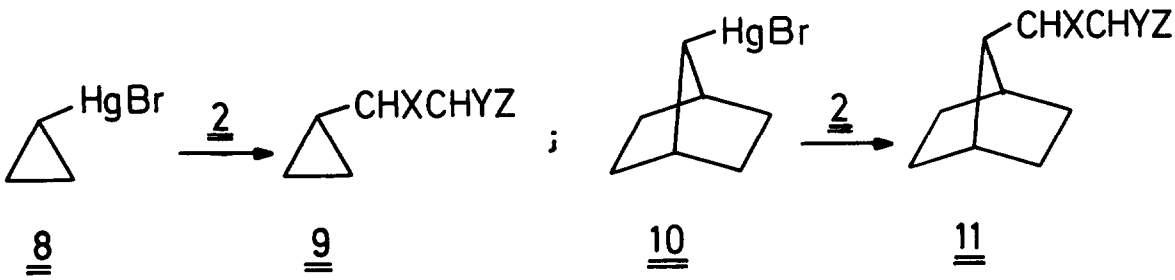
1 2 3



4 5

6 7

The reduction of cyclopropylmercuric bromide or 7-norbornylmercuric bromide is carried out with a 3 molar amount of $NaBH_4$ or $NaBH(OCH_3)_3$ in the presence of a threefold excess of alkene 2 in CH_2Cl_2 (10% solution) at room temperature (30-60 min). After filtration and destillation products 9 and 11 are formed in 50-70% yields (Table I).



8 9 10 11

Table I

Yields of products 9 and 11 by reduction of organomercuric salts 8 and 10 in the presence of alkenes 2.

Alkenes 2			Yields (%) of Products	
X	X	Z	9	11
H	H	CO_2CH_3	53	56
H	H	CN	61	63
H	Cl	CN	61	60
$CO_2C_2H_5$	H	$CO_2C_2H_5$	67	70

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