

Disproportionation of Pent-2-ene by a Homogeneous Rhenium Pentachloride–Tetrabutyltin Catalyst

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Summary A mixture of rhenium pentachloride and tetrabutyltin is an active homogeneous catalyst for the disproportionation of pent-2-ene.

TUNGSTEN, molybdenum and rhenium compounds have been reported to be the most active heterogeneous catalytic systems for the disproportionation of alkenes.¹ Recently

homogeneous catalysts based on tungsten and molybdenum have also been reported,^{2,3} and we report here a homogeneous catalyst based on rhenium. We have found that a mixture of ReCl_5 and Bu_4Sn catalyses the disproportionation of pent-2-ene into but-2-ene and hex-3-ene at room temperature. Commercial ReCl_5 (Johnson Matthey Ltd.) was used without further purification, with dried chlorobenzene as solvent. Products were analysed by g.l.c. and the main products identified (i.r. spectrometry) as the expected but-2-ene and hex-3-ene.

In a typical experiment pent-2-ene (2 ml) was added at 20 °C to a mixture of chlorobenzene (17 ml), ReCl_5 (0.14 g), and Bu_4Sn (0.2 g) (see Table). The results in the Table show clearly that disproportionation occurs. The co-catalyst, Bu_4Sn , has a pronounced influence on the product distribution; ReCl_5 has been found to catalyse Friedel-Crafts reactions without a cocatalyst.⁴ Bu_4Sn appears to inhibit the alkylation and oligomerisation ability

TABLE

Disproportionation of pent-2-ene by a homogeneous ReCl_5 - Bu_4Sn catalyst

Reaction time h	..	..	4	24	46
Composition (in mol %)					
But-2-ene	..	..	1	16	21
Pent-2-ene	..	..	96	59	50
Hex-3-ene	..	..	1	18	23
Other products ^a	..	..	2	7	6

^a Products arising from the formation of the catalytic system and higher molecular weight products owing to side reactions.

of ReCl_5 profoundly, so that only a low percentage of higher molecular weight products was present in the reaction mixture.

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