HYDROGENOLYSIS OF DIFURYLETHANE ON A PALLADIUM CATALYST

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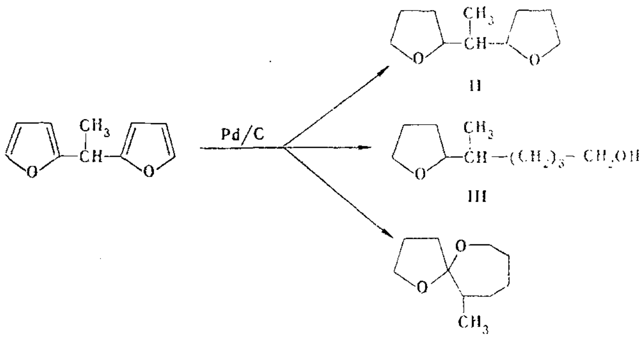
Palladium on charcoal is a widely used catalyst for the hydrogenation of the furan ring. Hydrogenolysis processes on this catalyst have been observed in individual cases [1] and have been ascribed to conjugation of the aryl substituents with the furan ring. In the present paper we describe an example of the hydrogenolysis of the furan ring on a palladium catalyst in the hydrogenation of 1,1-di(2-furyl)ethane (I), viz., a compound that does not contain conjugated furan rings.

We have found that the hydrogenation of I in absolute ethanol on ruthenium and platinum catalysts (at 70-100°C and 100-130 atm) proceeds smoothly to give diastereomers of 1,1-bis(2-tetrahydrofuryl)ethane (II). At the same time, hydrogenation on a palladium catalyst leads to a mixture of products of hydrogenation and hydrogenolysis, viz., 5-(2-tetrahydrofuryl)-1-hexanol [III, bp 125°C (8 mm)] and 6-methyl-1,8-dioxaspiro[4,6]undecane [IV, bp 75°C (8 mm)].



The structure of the compounds obtained were proved by means of the IR, PMR, and mass spectra. Thus the following signals are present in the PMR spectrum of alcohol III (CCl_4): 0.84-0.95 (3H, two 2, J = 7 Hz), 1.06-1.58 (8H, m), 1.82-2.0 (3H, m), 2.71 (1H, s), 3.6 (2H, t, J = 6 Hz), and 3.66-3.87 ppm (3H, m). A molecular-ion peak with m/z 172 is present in the mass spectrum. The following signals are observed in the PMR spectrum of acetal IV: 0.8-0.87 (3H, d, J = 7 Hz), 1.4-2.2 (11H, m), 3.5-3.6 (H, two t), and 3.75-3.90 ppm (3H, m). The IR spectrum of acetal IV does not contain absorption bands that correspond to the carbonyl and hydroxy groups, whereas the mass spectrum contains a molecular ion peak with m/z 170 that confirms the cyclic structure of the compound obtained.

Thus we have observed the hydrogenolysis of the furan ring on a palladium catalyst in the absence of conjugation of the furan ring. The hydrogenolysis proceeds regioselectively and involves the C–O bond of the furan ring that is adjacent to the substituent in the α position.

LITERATURE CITED

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