

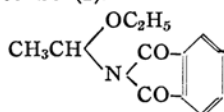
LETTER

Addition Reactions of Amino Compounds to Ethyl Vinyl Ether

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A new product (A) was obtained in the reaction between phthalimide and ethyl vinyl ether without any added catalyst. The analysis and the molecular weight determination suggest that (A) is likely to be an addition product, the structure of which being assumed to be either (I) or its β -isomer. In view of the fact that similar addition reactions of alcohols¹⁾ and phenols²⁾ form acetals, the α -adducts, the adduct (A) may be expected to be (I).



(I) N- α -Ethoxyethylphthalimide

On decomposition by hydrochloric acid, the adduct (A) gave rise to acetaldehyde along with phthalimide. The formation of acetaldehyde is in favor of the structure of N- α -isomer (I).

A similar addition product (B) has likewise been obtained from a reaction with carbazole as the amino component. On the other hand, Voronkov³⁾ reported that vinyl ethers condense with monocarboxylic acid amides to yield ethylidene-di-O-acylamide, $\text{CH}_3\text{CH}[\text{OC}(=\text{NH})\text{R}]_2$, in the presence of hydrochloric acid. The structure of the O-acylamide type is obviously excluded from the

possible structures for the adduct (B), but is not for the adduct (A).

It was found that vinyl acetate also may condense with phthalimide to give rise to a similar adduct.

Detailed examinations as to the structure of the adducts as well as experiments on the reactions between vinyl compounds and various amino compounds (imides, amides and amines) are now in progress in our laboratory.

Experimental

A mixture of 22.0 g. (0.15 mol.) of phthalimide and 32.4 g. (0.45 mol.) of ethyl vinyl ether was heated at 155° for 5 hours in a 100 cc.-autoclave. Evaporating the unreacted vinyl ether, a viscous oily residue was obtained, which gradually turned into a crystalline matter. The yield of the adduct was quantitative. Being recrystallized from petroleum benzene and alcohol, colorless crystals (A) were obtained which showed m.p. 64~65°. *Anal.* Calcd. for (I), $\text{C}_{12}\text{H}_{13}\text{O}_3\text{N}$: C, 65.74, H, 5.98, N, 6.39. Found: C, 65.92, H, 5.52, N, 6.82. *Molecular weight*: Calcd. 219.23; Found: 216 (cryoscopic method). Boiling 5 g. of (A) with 14 cc. of hydrochloric acid (1:1), phthalimide and acetaldehyde were formed in almost equimolecular amount, which were identified by mixed melting with authentic specimens of the imide and of the 2,4-dinitrophenylhydrazone, respectively.

The experiment for carbazole was essentially the same as stated above.

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2) M. F. Shostakovskii, *ibid.*, **20**, 608 (1950); *Chem. Abst.*, **44**, 7754 (1950).

3) M. G. Voronkov, *J. Gen. Chem.* (U. S. S. R.), **21**, 1631 (1951); *Chem. Abst.*, **46**, 8002 (1952).