

CHEMICAL TRANSFORMATIONS OF SOLID ORGANIC COMPOUNDS UPON HIGH-PRESSURE
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Solid organic compounds or their mixtures with inert substances are capable of undergoing chemical reactions upon extrusion through a ring aperture by the action of high pressure. The external diameter of the aperture was 16 mm, the clearance was 0.05-0.15 mm, and the pressure was 15-30 kbar. The central part of the extrusion device was capable of rotation, thereby creating additional stress and shear deformation in the extruded substance.

Under these conditions, the ammonium salts of unsaturated acids such as acrylic, fumaric, crotonic, and cinnamic acids and their mixtures with adamantane and NH_4Cl may be converted to the corresponding amino acids: β -alanine (10% yield), aspartic acid (18% yield), β -aminobutyric acid (3% yield), and β -phenyl- β -alanine (4% yield). The ammonium salt of lauric acid reacts upon extrusion to form the amide of lauric acid in 2% yield. Acrylamide and methacrylamide polymerize to form polyacrylamide in 60% yield and polymethacrylamide in 30% yield. Benzoyl peroxide undergoes 50-70% decomposition at the $-\text{O}=\text{O}$ -bond.

Product yield increases with increased extrusion pressure and decreased clearance. For example, the decomposition for benzoyl peroxide at 15 kbar extrusion pressure and 0.1 mm clearance is 22%, but it becomes 41% when the clearance is changed to 0.05 mm, and it remains 41% at fixed 0.05 mm clearance at constant 15 kbar extrusion pressure. If the clearance is unchanged at 0.05 mm and the extrusion pressure is increased to 20 kbar, the decomposition becomes 73%.

The amide of lauric acid and the amino acids were analyzed as the methyl esters of the N-formylbutoxy derivatives by gas-liquid chromatography [1].

LITERATURE CITED

1. M. Makita, S. Yamamoto, and T. Yukiko, *Clin. Chim. Acta*, **88**, 308 (1978).