

The Production of Isophorone

Subjects: Chemistry, Applied

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Isophorone is a technically important compound used as a high-boiling-point solvent for coatings, adhesives, etc., and it is used as a starting material for various valuable compounds, including isophorone diisocyanate, a precursor for polyurethanes. For over 80 years, isophorone has been synthesized via base-catalyzed self-condensation of acetone. This reaction has a complex reaction mechanism with numerous possible reaction steps including the formation of isophorone, triacetone dialcohol, and ketonic resins. This review provides an overview of the different production processes of isophorone in liquid- and vapor-phase and reviews the literature-reported selectivity toward isophorone achieved using different reaction parameters and catalysts.

Keywords: catalysis ; self-condensation ; acetone ; isophorone ; base-catalyzed

In celebration of the 60th anniversary of the isophorone (IP) production at the Hilbernia AG production site in Herne (Germany), which today belongs to the Evonik AG ^{[1][2]}, this review provides a detailed overview of the current state of science of the product IP, its applications, its production methods, and reviews the catalytic research for its synthesis.

The technical importance of IP is justified by its use as a solvent and starting material for several chemical processes, and due to its possibility to be synthesized from acetone (Ace) ^{[3][4][5][6]}. Ace is the coproduct of the phenol production, the cumene process, with a global Ace production output of 7.8 Mio. tons in 2020 ^[7]. Although processes for the synthesis of IP from Ace were known before 1960, the major production of IP began in 1962 in West Germany ^{[1][2][8]}. Today, there are mainly two production methods for IP, a liquid- and a vapor-phase process. The estimated annual production volume exceeds 100,000 t/y ^[6] and the market is expected to further grow in the future ^{[6][9][10]}.

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