ABSTRACT

Process Economics Program Report No. 11D

METHACRYLIC ACID AND ESTERS

(January 1993)

Methacrylate esters and methacrylic acid (MAA) are widely used in clear polyacrylate plastics and in surface coatings such as acrylic latex paints. This report concentrates on the most important ester, methyl methacrylate (MMA). For many years, MMA has been made almost exclusively by a three-step process from acetone and HCN, via acetone cyanohydrin (ACH). In the ACH process, large proportions of sulfuric acid are used, and disposal of the acidic sludge by-product is expensive. Alternative processes and other raw materials are under development, and several plants based on a new C_4 process have been built in Japan. The C_4 process is based on two-stage vapor-phase oxidation of isobutylene or t-butanol to make methacrylic acid.

This report contains updated evaluations of the ACH process, the C_4 process, and processes that start with propionaldehyde or isobutyric acid. Also included is a new evaluation of a commercial variation of the C_4 process (10¢/lb lower product value) and an update of an evaluation of a variation of the ACH process (soon to be commercial) in which sulfuric acid is not used and capital is lower (7¢/lb lower product value).

In addition, this report includes new evaluations of noncommercial processes that start with propionic acid or propyne. The propyne process is especially attractive, because it produces MMA by a single-step carbonylation at very high yields. It has a lower product value than any of the other processes in this report.

This report is of special interest to current and potential producers of MMA, and to companies that produce the raw materials or intermediates. Purchasers of MMA will also be interested. Process engineers will find that the many different processing steps described here in detail can be adapted to the large-scale production of numerous other chemicals.

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