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Abstract

Acrylic acid is a major building block in the production of many industrial and consumer products. The global market for acrylic acid was approximately 5.4 million metric tons in 2015, with growth forecast at 4.2% annually during 2013–18 [4]. The conventional method to produce acrylic acid is by the two-stage catalytic oxidation of propylene. Most acrylic acid is converted into commodity esters from crude acrylic acid (CAA), generally >97% purity. The most commonly used processes are based on Nippon Shokubai, BASF, BP (Sohio), and Mitsubishi catalysts or technologies.

The focus of this review is five conventional acrylic acid production processes using propylene as a feedstock. Propylene-based acrylic acid production processes covered herein are by BASF, Nippon Shokubai (original and updated), Mitsubishi Chemical, and Lurgi/Nippon Kayaku. The production economics will be presented for ester-grade acrylic acid and glacial-grade acrylic acid, comparing technical features and environmental impacts.

Given that feedstock prices can fluctuate greatly over time, a traditional process economics snapshot comparison for a particular time and region can often be misleading if applied to investment decisions. For investment purposes, using historical process economic comparisons over a long period of time provides a better basis. To address the impact of feedstock price fluctuations, this process summary is accompanied by an iPEPSpectra™ interactive data module that allows for quickly comparing historical process economics of competing technologies in several major regions. The iPEPSpectra™ module uses Microsoft Excel pivot tables and is a powerful interactive tool for comparing process economics at various levels, such as variable costs, plant gate costs, full production costs, and capital costs. An iPEPSpectra™ historical economic comparison provides a more comprehensive assessment of competing technologies and enhances investment decisions. Also included is an iPEP Navigator interactive module, which provides an economic snapshot for each process, allowing the user to select and compare the processes, units, and regions of interest. These modules have recently been developed by the IHS Chemical Process Economics Program (PEP), and both are attached to the electronic version of this review.

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