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Acrylic Acid

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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 million metric tons in 2013, worth \$8 billion, with growth forecast at 4.2% annually during 2013–18. 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 of acrylic acid). The most commonly used processes are based on Nippon Shokubai, BASF, BP (Sohio), and Mitsubishi catalysts or technologies.

Our prior PEP Report on acrylic acid production by the two-stage catalytic oxidation of propylene was published in 2003, and covered BASF's and Nippon Shokubai's conventional acrylic acid and ester production processes. In recent years, there has been significant research on reducing the cost of acrylic acid production. Mitsubishi Chemical has recently announced development of a new waved-plate reactor for performing oxidation reactions such as propylene oxidation to acrylic acid. The company claimed significantly reduced investment and variable costs. Nippon Shokubai has continued to improve its conventional acrylic acid process by developing a single oxidation reactor capable of replacing the tandem oxidation reactors and improving the acrylic acid recovery process. In 2004, Lurgi started licensing an acrylic acid process using Nippon Kayaku's catalysts. In 2004, LG Chem announced it had developed a new advanced acrylic acid process.

The focus of the report is conventional acrylic acid production processes using propylene as a feedstock. Propylene-based acrylic acid production processes by BASF, Nippon Shokubai, LG Chem, Mitsubishi Chemical, and Lurgi/Nippon Kayaku will be presented. In addition, acrylic acid from other feedstocks including propane, formaldehyde with acetic acid, ethylene oxide with carbon monoxide, and renewable raw materials will be discussed. Production economics of three propylene-based processes—Nippon Shokubai, Mitsubishi Chemical, and Lurgi/Nippon Kayaku—will be presented.



Contents

1	Introduction	1-1
2	Summary	2-1
	Introduction	2-1
	Industrial aspects	2-1
	Grades of acrylic acid	2-1
	Consumption of acrylic acid	2-1
	Acrylic acid production capacity	2-2
	Acrylic acid producers	2-3
	Process licensors and process owners	2-4
	Technical aspects	2-4
	Propylene-based acrylic acid production processes	2-4
	Nippon Shokubai process	2-5
	Mitsubishi Chemical process	2-7
	Lurgi/ Nippon Kayaku process	2-8
	Economic aspects	2-9
	Capital cost comparison	2-10
	Variable production cost comparison	2-12
	Total production cost comparison	2-12
	Product value comparison	2-13
3	Industry status	3-1
	Introduction	3-1
	Consumption and growth	3-1
	Grades of acrylic acid	3-1
	Consumption	3-2
	Commodity acrylate ester	3-3
	Glacial acrylic acid	3-5
	Growth	3-6
	Acrylic acid prices	3-6
	Acrylic acid production	3-6
	Process technology	3-6
	Process licensors and process owners	3-7
	Producers	3-9
	New capacity	3-13
4	Acrylic acid production chemistry & technology	4-1
	Introduction	4-1
	Acrylic acid production	4-2
	Acrylic acid from propylene	4-2
	Propylene two-stage oxidation	4-3
	BASF process	4-6
	Nippon Shokubai process	4-8
	LG Chem process	4-13
	Mitsubishi Chemical process	4-15
	Lurgi/Nippon Kayaku process	4-19
	Recent Nippon Kayaku patents	4-20
	Recent Lurgi patents	4-21
	Acrylic acid from propane	4-25
	Acrylic acid from propane via oxydehydrogenation propylene	4-25
	Acrylic acid from propane via dehydrogenation to propylene	4-26

Acrylic acid from propane via direct oxidation	4-27
Acrylic acid from C1 raw materials	4-28
Acrylic acid from formaldehyde	4-28
Acrylic acid from ethylene oxide and CO	4-29
Acrylic acid from renewable raw materials	4-30
Acrylic acid via thermal decomposition	4-30
Acrylic acid via fermentation of sugar to form 3-hydroxypropionic acid	4-30
Acrylic acid via fermentation of sugar through fumaric acid	4-30
Acrylic acid via fermentation of renewable feedstock to form lactic acid	4-31
Acrylic acid from glycerin	4-31
5 Acrylic acid production using Nippon Shokubai technology	5-1
Introduction	5-1
Process description	5-1
Section 100: reaction section	5-6
Section 200: acrylic acid recovery section	5-7
Process discussion	5-7
Oxidation reactor	5-7
Absorption column	5-8
Acrylic acid recovery	5-8
Material of construction	5-9
Waste generation	5-9
Cost estimates	5-10
Capital costs	5-10
Production costs	5-13
Sensitivity of acrylic acid production cost to propylene feedstock cost	5-14
Comparison of process economics of updated Nippon Shokubai acrylic acid production process to earlier process (PEP Report 6D)	5-16
6 Acrylic acid production using mitsubishi chemical technology	6-1
Introduction	6-1
Process description	6-1
Section 100: reaction section	6-7
Section 200: acrylic acid recovery section	6-8
Process discussion	6-8
Oxidation reactor	6-8
Absorption column	6-10
Acrylic acid recovery	6-10
Material of construction	6-10
Waste generation	6-10
Cost estimates	6-11
Capital costs	6-11
Production costs	6-13
Sensitivity of acrylic acid production cost to propylene feedstock cost	6-15
Comparison of process economics of Mitsubishi Chemical acrylic acid production process to a conventional acrylic acid production process (PEP Report 6D)	6-17
7 Acrylic acid production using Lurgi/Nippon Kayaku technology	7-1
Introduction	7-1
Process description	7-1
Section 100: reaction section	7-7
Section 200: acrylic acid recovery section	7-8
Process discussion	7-9
Internal themoplate condenser	7-9

Acrylic acid recovery	7-10
Material of construction	7-10
Waste generation	7-11
Plant plot requirements	7-11
Cost estimates	7-12
Capital costs	7-12
Production costs	7-14
Sensitivity of acrylic acid production cost to propylene feedstock cost	7-16
Design conditions	B-1
Cost bases	B-1
Capital investment	B-1
Project construction timing	B-3
Available utilities	B-3
Production costs	B-3
Effect of operating level on production costs	B-4
Appendix A: Patent summary table	A-1
Appendix B: Design and cost bases	B-1
Appendix C: Cited references	C-1
Appendix D: Patent references by company	D-1
Appendix E: Design and cost bases	E-1

Tables

Table 1.1	Physical properties of acrylic acid	1-2
Table 2.1	Acrylic acid capacity by region—December 2014	2-3
Table 2.2	Leading global producers of acrylic acid—December 2014	2-4
Table 2.3	Process licensors/technology owners	2-4
Table 2.4	Comparison of propylene-based acrylic acid production processes	2-5
Table 2.5	Comparison of Nippon Shokubai process from current design bases and PEP Report 6D design bases	2-6
Table 2.5	Comparison of product values for acrylic acid processes	2-14
Table 3.1	Typical properties of glacial acrylic acid	3-2
Table 3.2	Applications for commodity acrylate esters	3-4
Table 3.3	US market prices for glacial acrylic acid	3-6
Table 3.4	Routes to acrylic acid	3-7
Table 3.5	Process licensors/technology owners	3-7
Table 3.6	Nippon Shokubai acrylic acid process licensors	3-8
Table 3.7	Acrylic acid capacity by region—December 2014	3-9
Table 3.8	Leading global producers of acrylic acid—December 2014	3-10
Table 3.9	Acrylic acid capacity by company and plant location—2014	3-10
Table 3.10	New announced acrylic acid capacity	3-13
Table 4.1	Routes to acrylic acid	4-2
Table 4.2	Propylene grades	4-3
Table 4.3	Patents for acrylic acid production with formaldehyde	4-28
Table 4.4	Bio-based routes to acrylic acid	4-30
Table 5.1	Design basis and assumptions	5-2
Table 5.2	Nippon Shokubai acrylic acid process—Stream flows	5-2
Table 5.3	Nippon Shokubai acrylic acid process—Major equipment	5-4
Table 5.4	Nippon Shokubai acrylic acid process—Utilities summary	5-6

Table 5.5	Summary of major waste streams	5-9
Table 5.6	Nippon Shokubai acrylic acid process—Total capital investment	5-11
Table 5.7	Nippon Shokubai acrylic acid process—Capital investment by section	5-12
Table 5.8	Nippon Shokubai acrylic acid process—Production costs	5-13
Table 5.9	Comparison of current design bases and PEP report 6D design bases	5-16
Table 5.10	Comparison of capital cost of updated nippon shokubai acrylic acid production process and earlier process	5-16
Table 5.11	Comparison of capital cost of updated nippon shokubai acrylic acid production process and earlier process	5-17
Table 6.1	Design basis and assumptions	6-2
Table 6.2	Mitsubishi chemical acrylic acid process—Stream flows	6-3
Table 6.3	Mitsubishi chemical acrylic acid process—Major equipment	6-5
Table 6.4	Mitsubishi chemical acrylic acid process—Utilities summary	6-7
Table 6.5	Summary of major waste streams	6-11
Table 6.6	Mitsubishi Chemical acrylic acid process—Total capital investment	6-12
Table 6.7	Mitsubishi Chemical acrylic acid process—Capital investment by section	6-13
Table 6.8	Mitsubishi Chemical acrylic acid process—Production costs	6-14
Table 6.9	Comparison of Mitsubishi Chemical acrylic acid process and a conventional acrylic acid production process (PEP Report 6D)	6-17
Table 6.10	Comparison of capital cost of Mitsubishi Chemical acrylic acid process and a conventional acrylic acid production process (PEP Report 6D)	6-18
Table 6.11	Comparison of production cost of Mitsubishi Chemical acrylic acid process and a conventional acrylic acid production process (PEP Report 6D)	6-18
Table 7.1	Lurgi/Nippon Kayaku design basis and assumptions	7-2
Table 7.2	Lurgi/Nippon Kayaku acrylic acid process—Stream flows	7-3
Table 7.3	Lurgi/Nippon Kayaku acrylic acid process—Major equipment	7-5
Table 7.4	Lurgi/Nippon Kayaku acrylic acid process—Utilities summary	7-7
Table 7.5	Lurgi/Nippon Kayaku acrylic acid process summary of major waste streams	7-11
Table 7.6	Lurgi/Nippon Kayaku acrylic acid process—Total capital investment	7-13
Table 7.7	Lurgi/Nippon Kayaku acrylic acid process—Capital investment by section	7-14
Table 7.8	Lurgi/Nippon Kayaku acrylic acid process—Production costs	7-15
Table A-1	Two-stage oxidation of propylene to acrylic acid	A-1
Table A-2	Propane to acrylic acid	A-13
Table A-3	Formaldehyde to acrylic acid	A-14
Table A-4	Ethylene oxide and carbon monoxide to acrylic acid	A-15
Table A-5	Lactic acid to acrylic acid	A-16

Figures

Figure 1.1	Acrylic acid	1-1
Figure 1.2	Acrylic acid value chain	1-3
Figure 1.3	Block flow diagram of acrylic acid production by a two-stage propylene oxidation process	1-3
Figure 2.1	Global acrylic acid consumption	2-2
Figure 2.2	Simplified flow diagram of Nippon Shokubai two-stage oxidation process to produce acrylic acid from propylene	2-7
Figure 2.3	Simplified flow diagram of Mitsubishi Chemical two-stage oxidation process to produce acrylic acid with azeotropic distillation	2-8
Figure 2.4	Simplified flow diagram of Lurgi/Nippon Kayaku two-stage oxidation process to produce acrylic acid with azeotropic distillation	2-9
Figure 2.5	Fixed capital cost comparison of several acrylic acid processes	2-10

Figure 2.6	Battery limits investment comparison of several acrylic acid processes	2-11
Figure 2.7	Off-sites investment comparison of several acrylic acid processes	2-11
Figure 2.8	Variable production costs comparison of several acrylic acid processes	2-12
Figure 2.9	Total production costs comparison of several acrylic acid processes	2-13
Figure 2.10	Total production costs comparison of several acrylic acid processes	2-13
Figure 3.1	Acrylic acid consumption	3-3
Figure 3.2	US acrylate ester consumption	3-3
Figure 3.3	China acrylate ester consumption	3-4
Figure 3.4	US glacial acrylic acid consumption	3-5
Figure 3.5	China glacial acrylic acid consumption	3-5
Figure 4.1	Simplified flow diagram of BASF two-stage oxidation process to produce acrylic acid from propylene from PEP Report 6D	4-6
Figure 4.2	Simplified flow diagram of updated BASF two-stage oxidation process to produce acrylic acid from propylene	4-8
Figure 4.3	Simplified flow diagram of Nippon Shokubai two-stage oxidation process to produce acrylic acid from PEP Report 6D	4-9
Figure 4.4	Single reactor two-stage oxidation process to produce acrylic acid	4-11
Figure 4.5	Simplified flow diagram of updated Nippon Shokubai two-stage oxidation process to produce acrylic acid from propylene	4-13
Figure 4.6	Simplified flow diagram of LG Chem two-stage oxidation process to produce acrylic acid	4-15
Figure 4.7	Mitsubishi Chemical waved-plate reactor	4-17
Figure 4.8	Simplified flow diagram of Mitsubishi Chemical two-stage oxidation process to produce acrylic acid with azeotropic distillation	4-19
Figure 4.9	Simplified flow diagram of Lurgi/Nippon Kayaku two-stage oxidation process to produce acrylic acid	4-20
Figure 4.10	Upright tubular reactor	4-22
Figure 4.11	Longitudinal section through a reactor tube	4-22
Figure 4.12	Distillation column with integrated plate condenser	4-24
Figure 4.13	Simplified flow diagram of acrylic acid from propane by oxydehydrogenation of propane to propylene	4-26
Figure 4.14	Molecular structure of fumaric acid	4-31
Figure 5.2	Single reactor two-stage oxidation process to produce acrylic acid	5-8
Figure 5.3	Historical propylene (chemical grade) price	5-15
Figure 5.4	Sensitivity of acrylic acid cost to propylene feedstock cost	5-15
Figure 6.2	Mitsubishi Chemical waved-plate reactor	6-9
Figure 6.3	Historical propylene (chemical) price	6-16
Figure 6.4	Sensitivity of acrylic acid cost to propylene feedstock cost	6-16
Figure 7.2	Distillation column with integrated plate condenser	7-10
Figure 7.3	Historical propylene (chemical grade) price	7-17
Figure 7.4	Sensitivity of acrylic acid cost to propylene feedstock cost	7-17
Figure 5.1	Nippon Shokubai acrylic acid process	E-1
Figure 6.1	Mitsubishi Chemical acrylic acid process	E-2
Figure 7.1	Lurgi/Nippon Kayaku acrylic acid process	E-4

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