

Chemical Profile: Crude Acrylic acid

By Aligoli Amir Nazmi Afshar, TranTech Consultants, Inc.; July 2014

USES

Acrylic acid is commercially available in major grades: (a) crude grade for esterification and polymerization, and (b) glacial grade for production of superabsorbent polymers and water soluble resins. About 44% of crude acrylic acid is used for GAA and acrylic esters which account for 56% of the world demand. Most of crude acrylic acid used captively and almost exclusively to make glacial acrylic acid and acrylates. End uses are 30% cosmetic/personal care (90% diapers, 10% feminine napkins and adult incontinent products); 18% coatings, 13% adhesives; 10% textiles (including specialty acrylates); 6% plastic modifier; 4% detergents; 2% polish; 3% paper coatings ; 2% water treatment; 2% ink/printing/dying.

SUPPLY/DEMAND

Global capacity stood at 6.3m tons/year in 2013, with 2.68m tons/year in Asia Pacific, 1.42m tons/year in the US, 1.23m tons/year in Western Europe, 770,000 tons/year in Japan, 81,400 tons/year in Eastern Europe, 80,000 tons/year in Africa, and 45,000 tons/year in Mexico.

Asia Pacific is the largest consumer, at about 2,07m tons/year, followed by the US at 1.4m tons/year and Western Europe at 1.1m tons/year. Japan, Eastern Europe, Africa, Mexico and Latin America consume 581,500 tons/year, 84,500 tons/year, 80,000 tons/year, 42,900 tons/year, 38,400 tons/year, respectively. Global demand in 2013 was 5.39m tons/year.

PRICING

There is a small merchant market and prices typically track propylene. Chinese contract prices in the first quarter were ¥12.1-13.3/kg. June contracts for Germany and the US were €1.62-1.79/kg and \$2.1-2.3/kg, respectively.

TECHNOLOGY

Most production is based on the gas phase catalytic oxidation of propylene via acrolein. The reaction can be carried out in single or two-step processes, but the latter is favoured because of higher yields. The oxidation of propylene produces acrolein, acrylic acid, acetaldehyde and carbon oxides. Acrylic acid from the primary oxidation can be recovered while the acrolein is fed to a second step to make acrylic acid. Purification can be carried out by azeotropic distillation or crystallization.

Novomer has developed a catalyst-based process which will convert the carbon monoxide and shale gas-based ethylene oxide into acrylic acid and other chemicals. Waste carbon dioxide is converted into carbon monoxide via solid oxide electrolyzing process. The electrolyzer operates like a fuel cell in reverse and can leverage the investments made-to-date by the government and private sector to more quickly commercialize the technology. Novomer is already planning to run a 2000 tons/year pilot plant for producing acrylic acid by 2015, and full commercial-scale by 2017. The most important application of this process is the manufacture of glacial acrylic acid

from transported polypropiolactone which is made from ethylene oxide and carbon monoxide. Polypropiolactone is stable and easily transported.

OUTLOOK

Several projects are planned in China, the world's fastest growing region. BASF-Sinopec added 160,000 tons new capacity in April 2014. TASNEE started a new 220,000 tons plant in May 2014. Others will add another 1.12m tons by 2016. Chinese capacity will rise to 2.36m tons/year by 2015 versus projected demand of 2.0m tons/year. New capacity will be needed beyond 2017.

Global demand growth is projected at 5.6%/year, with China at 10%/year. West European growth is 2%/year, USA at 3%/year and Japan just 1.6%/year.

MAJOR GLOBAL CRUDE ACRYLIC ACID CAPACITY '000 TONS/YEAR, 2013^(*)

Company	Location	Capacity
American Acryl ⁽¹⁾	Bayport, TX, USA	125.00
Arkema	Carling, France	275.00
	Clear Lake, TX, USA	270.00
BASF	Freeport, TX, USA	239.00
	Antwerp, Belgium	320.00
	Ludwigshafen, Germany	270.00
	Guaratingueta, Brazil ⁽²⁾	160.00
BASF-Petronas JV	Kuantan, Malaysia	160.00
BASF-Sinopec JV	Nanjing, China ⁽³⁾	160.00
CNPC (Jilin)	Jilin, China	65.00
CNPC (Lanzhou Pet)	Lanzhou, China	80.00
Dow Chemical	Cangrejera, Mexico	45.00
	Taft, LA, USA	125.00
	BSL, Germany	100.00
	Deer Park, TX, USA	660.00
Formosa Plastics	Mailiano, Taiwan	100.00
	Ningbo, China	160.00
	Kaohsiung, Taiwan	60.00
Gazprom Salavat	Salavat, Russia ⁽⁴⁾	80.00
Idemitsu Petrochemical	Nagoya, Japan	50.00
Jiangsu Jurong-Arkema	Yancheng, China ⁽⁵⁾	320.00
LG Chemical	Naju, South Korea	65.00
	Yeosu, South Korea ⁽⁶⁾	285.00
Mitsubishi Chemical	Yokkaichi, Japan	200.00
Momentive	Sokolov, Czech Republic ⁽⁷⁾	55.00
Nippon Shokubai	Cilegon, Indonesia	140.00

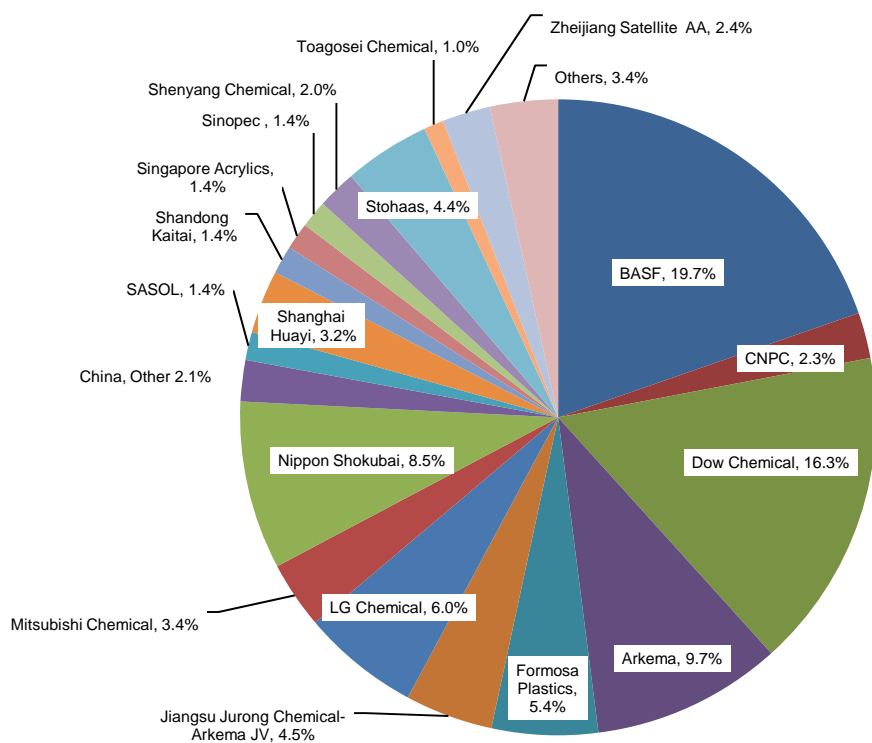
	Himeji, Japan ⁽⁸⁾	460.00
Other China Producers	Several Locations, China	150.00
SASOL	Sasolburg, South Africa	80.00
Shandong Kaitai	Zibo, China	110.00
Shanghai Huayi	Shanghai, China ⁽⁹⁾	220.00
Shenyang Chemical	Shenyang, China	130.00
Sibur	Dzerizhinsk, Russia	26.00
Singapoue Acrylics	Pulau Sakra, Singapore	82.00
Sinopec (Beijing Eastern)	Beijing, China	85.00
Stohaas	Marl, Germany	265.00
TASNEE	Al Jubail, Saudi Arabia ⁽¹⁰⁾	220.00
Toagosei Chemical Industry	Tsurusaki, Japan	60.00
Zhejiang Satellite Acrylic	Jiaxing, China ⁽⁵⁾	160.00
Zhenghe Petrochemical	Guangrao, China	60.00

(1) Nippon Shokubai-Arkema JV; (2) New for 2016?; (3) Expanded 160, 4/2014; (4) New 2014; (5) Expansion of 160, 2014/2015;

(6) Expansion of 225, 2014/2015; (7) Expansion of 25, 2014/2015; (8) Expansion of 80, 2014; (9) Expansion of 160 kt, 2015/2016;

(10) Started 5/2014 (*) Over 20 kt

GLOBAL MARKET SHARES FOR CRUDE ACRYLIC ACID in 2013



For more information about market and site-specific/technology-specific investment and production cost data for crude acrylic acid and some 1000 more chemicals, please send your inquiries to trantech@chemplan.biz.

