

CHEMICAL PROFILE: GLACIAL ACRYLIC ACID

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USES

Glacial acrylic acid (GAA) is a versatile monomer that can be polymerized to complex molecular arrangements. Cross-linked polymers are used as superabsorbent polymers in diapers (52%), adult incontinence (6%) and feminine hygiene products (2.5%). Homo-, co- and ter-polymers are used as sequestrant in detergents (8%), coatings (7.1%), specialty esters (7%), in adhesives (3%), as antiscalant in water treatment (3%), as dispersant in clay and calcium carbonate (2% each). Minor uses are found as a comonomer of polyacrylamide flocculants in waste treatment, printing/dyeing and zinc diacrylate (1% each). Some 3% is consumed in horticulture, landscaping, soil conditioning, cables, drilling fluids and transportation of seafood.

SUPPLY/DEMAND

Global capacity stood at 2.75m tons/year in 2013, with 859,000 tons/year in Asia Pacific, 691,000 tons/year in the US, 669,000 tons/year in Western Europe and 507,000 tons/year in Japan. Asia Pacific and the US are the largest consumers at about 640,000 tons/year each, followed by Western Europe at 579,000 tons/year and 407,000 tons/year in Japan. Minor quantities are consumed in other regions of the world.

PRICING

The price depends on color and purity. Most common GAA has an American Public Health Association color index of less than 10, maximum dimer content of 500ppm and purity of 99.6%. German prices in the first quarter of 2014 were between €1.95-2.12/kg. Contract prices in May for the US and China were between \$2.44-2.64/kg and ¥13.4-15.1/kg, respectively.

TECHNOLOGY

Glacial grade is produced by second distillation or crystallization of crude acrylic acid.

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. In contrast to unstable glacial acrylic acid, polypropiolactone is stable and easily transported.

Dow and OFXBIO have jointly developed the BioAcrylic process where sugar is converted to 3-hydroxypropionic acid by fermentation, followed by dehydration of 3-HP to crude acrylic acid which is purified to GAA. The anticipated commercialization is 2015-2016.

OUTLOOK

Global demand growth is forecast at 5% /year to 2018. Regionally, consumption will rise by 10%/year in Asia Pacific, 8%/year in Asia/Middle East, 5%/year in Eastern Europe and Africa, 2.5%/year in the US and Western Europe, 1.5%/year in Japan and 3-4%/year for the rest of the world. The most important growth will be in China at 12%/year in baby diapers.

Several projects are planned in China, the world's fastest growing region. BASF-Sinopec added 60,000 tons new capacity in April 2014. TASNEE started a new 85,000 tons plant in May 2014. Others will add another 366,000 tons by 2016. Chinese capacity will rise to 649,000 tons/year by 2015 versus projected demand of 610,000 tons/year. New capacity will be needed beyond 2016.

MAJOR GLOBAL GLACIAL ACRYLIC ACID CAPACITY '000 TONS/YEAR, 2013

Company	Location	Capacity
American Acryl ⁽¹⁾	Bayport, TX, USA	87.00
Arkema	Carling, France	107.00
	Clear Lake, TX, USA	165.00
BASF	Freeport, TX, USA	173.00
	Antwerp, Belgium	120.00
	Ludwigshafen, Germany ⁽²⁾	160.00
BASF-Petronas JV	Kuantan, Malaysia	24.00
	Guaratingueta, Brazil ⁽³⁾	60.00
BASF-Sinopec JV	Nanjing, China ⁽⁴⁾	60.00
Beijing Huapin Yide	Tongzhou Park, China	5.00
CNPC (Jilin)	Jilin, China	12.00
Dow Chemical	Deer Park, TX, USA	265.00
	BSL, Germany	80.00
Formosa Plastics	Mailiano, Taiwan	40.00
	Ningbo, China	40.00
	Kaohsiung, Taiwan	40.00
Gazprom neftekhim Salavat	Salavat, Russia ⁽⁵⁾	35.00
Idemitsu Petrochemical	Nagoya, Japan	30.00
Jiangsu Jurong-Arkema	Yancheng, China ⁽⁶⁾	120.00
LG Chemical	Naju, South Korea	60.00
	Yeosu, South Korea ⁽⁷⁾	150.00
Mitsubishi Chemical	Yokkaichi, Japan	110.00
Momentive	Sokolov, Czech Republic ⁽⁸⁾	16.00
Nippon Shokubai	Cilegon, Indonesia	90.00
	Himeji, Japan	315.00
Other China Producers	Several, China	15.00

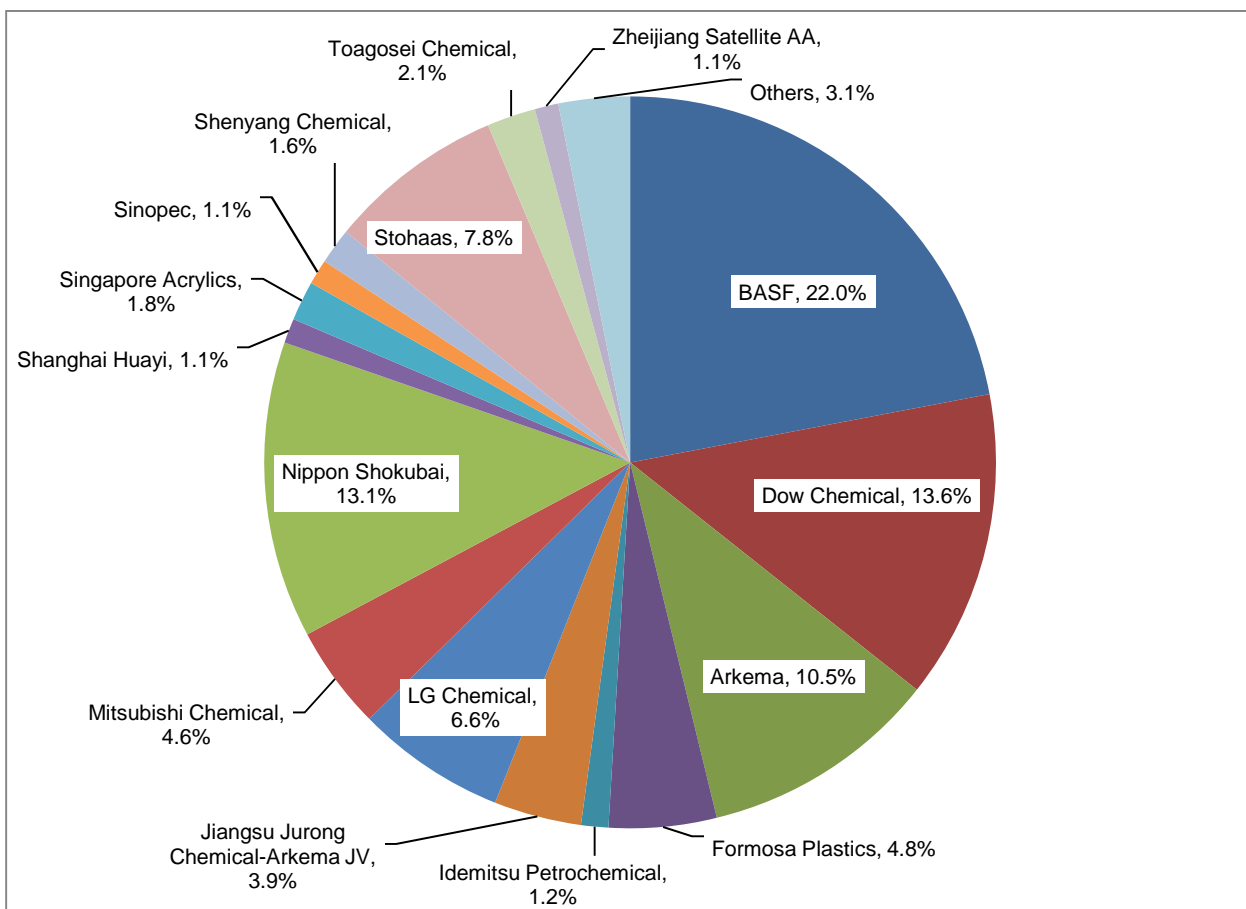
Puyang Lixin Fine Chemicals	Puyang, China	10.00
SASOL	Sasolburg, South Africa	10.00
Shandong Kaitai	Zibo, China	20.00
Shanghai Huayi	Shanghai, China ⁽⁹⁾	30.00
Shenyang Chemical	Shenyang, China	40.00
Singapore Acrylics	Pulau Sakra, Singapore	52.00
Sinopec (Beijing Eastern)	Beijing, China	27.00
Stohaas	Marl, Germany	202.00
TASNEE	Al Jubail, Saudi Arabia ⁽¹⁰⁾	85.00
Toagosei Chemical Industry	Tsurusaki, Japan	52.00
Zhejiang Satellite AA	Jaxing, China ⁽¹¹⁾	30.00

(1) Nippon Shokubai-Arkema JV; (2) Expansion to 218 kt in 2016?; (3) New in 2016?; (4) Expanded to 120 kt in 4/2014; (5) New in 2014;

(6) Expansion to 240 in 2014/2015; (7) Expansion to 210 kt in 2014/2015; (8) Expansion to 24 kt in 2014/2015; (9) Expansion to 60 kt in 2015/2016;

(10) Started in 5/2014; (11) Expansion to 60 kt in 2014/2015

GLOBAL MARKET SHARES FOR GLACIAL ACRYLIC ACID IN 2013



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

