

# c&en's GLOBAL TOP

# 50

**Chemical profits continue to rise as  
the global economy booms**

ALEXANDER H. TULLO, C&EN NEW YORK CITY

**C**hemical executives should remember 2017 fondly. According to C&EN's annual survey of the Global Top 50 chemical companies, sales rose strongly for the group, and profits did even better.

The 50 companies combined for \$851.0 billion in chemical sales for 2017, the fiscal year on which the survey is based, a 12.2% increase from the year before. Only nine of the firms saw sales decline. This is a turnaround from recent surveys, as the Global Top 50 had seen sales decline in 2015 and 2016. A strong economy and rising oil prices led to the revenue increase.

Profitability swelled for the 48 of the 50 large chemical firms that publicly report profit figures. The companies combined for \$108.6 billion in chemical earnings last year, a 14.4% increase from the year-ago period. No company lost money, and merely 13 reported a decline in profits.

The world economy continues to perform well this year, and the chemical industry should benefit from that once again. However, one storm cloud on the horizon is trade.

Should the U.S. and China go through with a trade war and mark \$200 billion in products for tariffs, the chemical industry—particularly U.S. petrochemical makers—could see an adverse impact.

This is the era of the chemical merger, and that trend has led to the debut of DowDuPont on the list at number 2. Linde's purchase of Praxair and a potential LyondellBasell Industries acquisition of Braskem could affect future rankings.

But on the whole, C&EN's Global Top 50 looks much as it did a year ago. Only two companies that appeared in the last survey—British catalyst firm Johnson Matthey and U.S. specialty chemical maker Lubrizol—didn't have the sales to make the cut this year. They were replaced by Chinese polyurethane juggernaut Wanhua Chemical and U.S. petrochemical maker Westlake Chemical.



## 1 BASF

► **2017 chemical sales:** \$69.2 billion

Despite the merger between Dow Chemical and DuPont, BASF maintains the top spot in C&EN's Global Top 50. DowDuPont launched in August and didn't have the full-year results to overtake the German chemical giant. BASF is hardly sitting still itself. The company is mulling its largest-ever investment: a \$10 billion integrated chemical complex in Guangdong, China, that would start coming on-line in 2026. BASF also has been making acquisitions. It is spending \$9 billion on seed and agricultural chemical businesses from Bayer, which needed to dispose of them to get its acquisition of Monsanto past regulators. The purchase will give BASF about \$10 billion in total ag sales and mark its entry into the seed business. BASF is also buying Solvay's nylon business for \$1.9 billion. Marking an exit from the energy sector, BASF plans to merge its Wintershall oil and gas businesses with German rival DEA. BASF also made a change at the top. In May, Kurt Bock, BASF's leader throughout most of the 2010s, passed the baton to Martin Brudermüller, a Ph.D. chemist who continues to serve as BASF's chief technology officer.

## 2 DowDuPont

► **2017 chemical sales:** \$62.5 billion

DowDuPont was born last August, a full 20 months after Dow Chemical and DuPont signed their merger agreement. Because the company's sales figure reflects results from Dow for a full year but from DuPont only since September, it hasn't knocked BASF out of the top spot. A full year of results for 2018 might change that when C&EN's next Global Top 50 survey drops a year from now. If all goes according to management's plan, 2018 should be the

only year we know DowDuPont as a company. It is scheduled to break into three companies, all of which should comfortably make the ranking, in 2019. One will be a materials science company with about \$44 billion in annual sales. It will bear the Dow name and be led by longtime Dow executive Jim Fitterling. Except for some packaging plastics businesses from the old DuPont, this company will be made up mostly of former Dow businesses. A new DuPont, constructed with former DuPont businesses plus electronic and other assorted specialty materials operations from Dow, will have \$21 billion in sales. Agricultural chemicals and seeds from both companies will be the nucleus of a new firm with \$14 billion in revenues, Corteva Agriscience.

## 3 Sinopec

► **2017 chemical sales:** \$55.3 billion

The past few months have been tough for China's largest chemical producer. In May, an explosion in a benzene tank at the Secco Petrochemical facility in Shanghai killed six contract workers who were performing repairs. Sinopec had taken over the facility from partner BP for \$1.7 billion just last year. Meanwhile, the Chinese push to improve air quality by switching from coal to natural gas heating led to a temporary natural gas shortage last winter, snarling chemical production in the country. However, 2017 was a good year for the company. It saw a 32% increase in sales. In a positive development for the firm, its Nanjing-based joint venture with BASF plans to double capacity for neopentyl glycol.

## 4 SABIC

► **2017 chemical sales:** \$37.6 billion

SABIC aspires to go deeper into specialty chemicals as a way to move beyond making bulk petrochemicals in its oil- and gas-rich home base of Saudi Arabia. This was the justification for its purchase of engineering polymer maker GE Plastics a decade ago. It was also the impetus behind SABIC's purchase of a 25% stake in the Swiss specialty chemical maker Clariant, 50th on this list, earlier this year for \$2.4 billion. The two firms were already partners in the chemical

process firm Scientific Design. SABIC's petrochemical business is diversifying geographically. It signed an agreement with ExxonMobil to build a massive petrochemical complex near Corpus Christi, Texas. And with Saudi national oil company Saudi Aramco, SABIC plans a crude-oil-to-chemicals plant that would have 9 million metric tons per year of output. Ties between the two Saudi firms may deepen: Saudi Aramco recently said it wants to buy a stake in SABIC.

## 5 Ineos

► **2017 chemical sales:** \$34.6 billion

Ineos and its founder, the energetic billionaire Jim Ratcliffe, are helping resuscitate the European petrochemical industry, which was rendered nearly irrelevant by the cheap shale-derived feedstocks available to U.S. petrochemical makers. Ineos's solution was to haul U.S. ethane to Europe on purpose-built ships. Those raw materials have been feeding Ineos's ethylene crackers in Scotland and Norway. Now Ineos plans to expand those plants and spend an additional \$3 billion on a new European propane dehydrogenation plant and the first ethylene cracker the continent has seen in a generation. The British company is also building a vinyl acetate plant in Europe. Ineos is investing in the U.S. too. It plans an ethylene oxide and derivatives complex and an  $\alpha$ -olefins plant, both on the Gulf Coast.

## 6 Formosa Plastics

► **2017 chemical sales:** \$32.1 billion

Formosa Plastics, an affiliate of Formosa Petrochemical, appears to be moving forward on a \$9.4 billion ethylene cracker complex, dubbed the Sunshine Project, in Louisiana. The Taiwanese company has purchased a 1,000-hectare tract along the Mississippi River in St. James Parish, La. Construction may begin next year and peak at 8,000 construction workers engaged at site. At its Taiwan homebase, Formosa continues to battle environmental activists and farmers who live near its facilities. The company is mulling building a water desalination plant at its giant Mailiao complex to assuage concerns that it is using too much freshwater from the area.

## 7 ExxonMobil

► **2017 chemical sales:** \$28.7 billion

ExxonMobil is always working on at least one major petrochemical project. Soon



**Martin Brudermüller (right) took over as head of BASF from Kurt Bock (left) earlier this year.**

CREDIT: BASF

the company could be juggling two. ExxonMobil has just put the final touches on a new ethylene cracker in Baytown, Texas. Now it is advancing a \$10 billion complex a bit farther down the coast in San Patricio County, Texas, near Corpus Christi. It has signed a joint venture agreement with SABIC for the project, and construction will commence once the environmental permits are in. It is also evaluating a project in Guangdong, China, that would feature an ethylene cracker and downstream derivatives.

## 8 LyondellBasell Industries

► **2017 chemical sales:** \$28.3 billion  
Basell's expensive purchase of Lyondell Chemical on the eve of the financial crisis in 2007 forced the newly minted LyondellBasell Industries into bankruptcy a year later. The company has been fiscally conservative ever since it emerged from Chapter 11 in 2010. Instead of building multi-billion-dollar U.S. crackers as its rivals did, it has opted for cheaper, incremental expansions. This frugality has garnered it much admiration in the financial community. But under Bob Patel, who took over as CEO in 2015, the company has been investing more assertively. It is spending \$2.4 billion to build the world's largest propylene oxide and *tert*-butyl alcohol facility, in Channelview, Texas. And LyondellBasell is back on the acquisition path with the purchase of plastics compounder A. Schulman for \$2.25 billion. That deal may prove to be small potatoes compared to what the company is considering next. In an acquisition that would be its largest since bankruptcy, LyondellBasell is negotiating to buy a majority stake in the Brazilian petrochemical maker Braskem, number 19 in this ranking. The purchase price could exceed \$10 billion.

## 9 Mitsubishi Chemical

► **2017 chemical sales:** \$26.4 billion  
Mitsubishi Chemical's industrial gas arm, Taiyo Nippon Sanso, has been the firm's most active division. The gas company is poised to enter the European market through the purchase of Praxair's European gas business for \$6 billion. The Praxair business, with annual sales of \$1.5 billion, is part of a package of several divestitures being made so Linde can win European Commission approval for its purchase of Praxair. This isn't the first time Taiyo Nippon Sanso made such a purchase. In 2016, its U.S. affiliate Matheson Tri-Gas bought air-separation and other plants in the U.S.

that regulators forced Air Liquide to divest during its takeover of Airgas.

## 10 LG Chem

► **2017 chemical sales:** \$23.2 billion  
As its electronic and battery materials business segment grows, LG Chem is planning a massive R&D expansion. By the turn of the next decade, it wants to boost its R&D headcount by 800, to 6,300 people. It is also launching an innovation contest promising grants of up to \$150,000 to scientists working in materials, biotechnology, and other fields. On the capital spending front, LG and China's Zhejiang Huayou Cobalt are investing \$450 million to set up a pair of Chinese joint ventures making cathode materials for electric vehicle batteries.

## 11 Air Liquide

► **2017 chemical sales:** \$22.6 billion  
Air Liquide is about to be knocked off its perch as the world's largest industrial gas maker. Rival Linde is buying U.S. leader Praxair, and combined they should edge out the French firm. Air Liquide continues to grow even without major acquisitions. Earlier this year, the company started up biomethane plants in the U.S., France, and U.K., doubling capacity for the fuel, which it extracts from landfills and other sources of waste. It has also invested more than \$10 million in the Chinese start-up STNE, which operates a fleet of 500 hydrogen-powered delivery trucks.

## 12 Reliance Industries

► **2017 chemical sales:** \$17.6 billion  
The Indian conglomerate is probably best known for operating the world's largest refinery in Jamnagar, India; being India's largest petrochemical maker; and even for running telecommunications operations and supermarkets. In a first for the region, the company has begun importing ethane from the U.S. in six new ships and is using this ethane to feed three Indian ethylene crackers. And through its recent purchase of Kemrock Industries, the company is now eyeing another world to conquer: carbon fiber composites.

## 13 DuPont

► **2017 chemical sales:** \$17.3 billion  
DuPont merged with Dow Chemical to become DowDuPont last August, but it had enough sales all by itself for eight months to make C&EN's ranking one last time. Eventually, the name DuPont will emblazon a new Wilmington, Del.-based chemical company made up mostly of old DuPont businesses, such as food ingredients and construction materials. It will also have a few gems from Dow,



A researcher at DuPont Industrial Biosciences' newly renovated headquarters in Wilmington, Del.

such as electronic materials and construction products. In May, DowDuPont CEO Ed Breen, speaking in front of an audience in New York City, gave some clues about how this new company will be run. It will shun "moon shot" R&D projects, deeply encoded in the DNA of the old DuPont, in favor of smaller-scale programs. It will trim 5–10% of its portfolio. Foreshadowing a potential future breakup, he reminded the audience that the new DuPont will consist of four businesses that could stand alone as separate companies.

## 14 Linde

► **2017 chemical sales:** \$16.9 billion  
Germany's Linde is close to becoming the largest industrial gas maker in the world with its purchase of Praxair. Combined, the firms generated about \$28.4 billion in sales for 2017, nearly \$6 billion more than the current leader, Air Liquide. But the German and French gas giants may end up a bit closer in size than that. Regulators want Linde to slough off some assets for competition reasons. Linde has inked an

# Global Top 50

BASF tops the ranking for the 12th year in a row, edging out DowDuPont.

RANK			CHEMICAL SALES (\$ MILLIONS)	CHANGE FROM 2016	CHEMICAL SALES AS % OF TOTAL SALES	HEADQUARTERS	CHEMICAL OPERATING PROFIT <sup>b</sup> (\$ MILLIONS)	CHANGE FROM 2016	CHEMICAL OPERATING PROFIT AS % OF TOTAL OPERATING PROFIT	OPERATING PROFIT MARGIN <sup>c</sup>	IDENTIFIABLE CHEMICAL ASSETS (\$ MILLIONS)	CHEMICAL ASSETS AS % OF TOTAL ASSETS	OPERATING RETURN ON CHEMICAL ASSETS <sup>d</sup>
2017	2016 <sup>a</sup>	COMPANY											
1	1	BASF	\$69,195	11.8%	95.0%	Germany	\$8,452	29.5%	87.8%	12.2%	\$75,490	84.8%	11.2%
2	2	DowDuPont <sup>e,f</sup>	62,484	29.7	100.0	U.S.	4,838	-14.1	100.0	7.7	192,164	100.0	2.5
3	3	Sinopec	55,323	31.5	15.8	China	3,993	30.8	37.7	7.2	23,453	9.9	17.0
4	4	SABIC	37,620	5.3	94.2	Saudi Arabia	6,367	1.6	101.6	16.9	73,411	85.4	8.7
5	6	Ineos	34,635	26.8	100.0	England	4,520	27.0	100.0	13.0	na	na	na
6	5	Formosa Plastics <sup>g</sup>	32,118	14.1	65.3	Taiwan	4,831	44.6	66.1	15.0	45,634	68.8	10.6
7	7	ExxonMobil	28,694	10.1	12.1	U.S.	5,544	-6.3	29.9	19.3	34,496	9.9	16.1
8	8	LyondellBasell Industries	28,319	15.0	82.1	Netherlands	5,980	6.1	100.3	21.1	na	na	na
9	9	Mitsubishi Chemical	26,422	12.6	79.5	Japan	2,670	43.3	78.7	10.1	31,413	74.9	8.5
10	12	LG Chem	23,217	24.8	100.0	South Korea	2,594	47.0	100.0	11.2	22,179	100.0	11.7
11	11	Air Liquide	22,617	13.3	98.4	France	2,147	9.9	102.2	9.5	42,316	97.0	5.1
12	20	Reliance Industries	17,555	31.9	26.5	India	3,255	63.0	38.8	18.5	19,022	15.2	17.1
13	10	DuPont <sup>e,h</sup>	17,281	-25.5	100.0	U.S.	2,706	-25.0	100.0	15.7	na	na	na
14	13	Linde	16,938	0.6	87.6	Germany	2,426	-3.1	94.3	14.3	na	na	na
15	15	Toray Industries	16,903	8.8	85.9	Japan	1,468	7.9	90.1	8.7	19,904	86.1	7.4
16	14	AkzoNobel <sup>g</sup>	16,471	2.7	100.0	Netherlands	1,578	-8.1	100.0	9.6	18,282	100.0	8.6
17	17	Evonik Industries	16,294	13.3	100.0	Germany	1,804	2.4	100.0	11.1	22,532	100.0	8.0
18	19	Covestro	15,977	18.8	100.0	Germany	3,077	116.1	100.0	19.3	12,816	100.0	24.0
19	16	Braskem	15,437	3.3	100.0	Brazil	3,071	1.9	100.0	19.9	16,716	100.0	18.4
20	18	PPG Industries <sup>g</sup>	14,750	3.4	100.0	U.S.	2,063	-12.4	100.0	14.0	16,538	100.0	12.5
21	21	Sumitomo Chemical	14,572	12.2	74.6	Japan	1,517	88.4	64.7	10.4	17,607	64.3	8.6
22	24	Lotte Chemical	14,060	20.0	100.0	South Korea	2,595	15.2	100.0	18.5	17,316	100.0	15.0
23	26	Shin-Etsu Chemical <sup>g</sup>	12,858	16.5	100.0	Japan	3,005	41.2	100.0	23.4	25,944	100.0	11.6
24	22	Solvay	12,308	-4.5	100.0	Belgium	1,536	3.0	100.0	12.5	24,241	100.0	6.3
25	27	Mitsui Chemicals	11,851	9.6	100.0	Japan	923	1.3	100.0	7.8	12,882	100.0	7.2
26	28	Praxair	11,437	8.6	100.0	U.S.	2,498	7.9	100.0	21.8	20,436	100.0	12.2
27	23	Yara	11,347	-3.5	100.0	Norway	457	-56.9	100.0	4.0	15,632	100.0	2.9
28	34	Lanxess	10,921	25.5	100.0	Germany	751	23.4	100.0	6.9	11,748	100.0	6.4
29	25	Bayer	10,823	-3.4	27.4	Germany	1,857	-13.4	23.0	17.2	14,811	17.5	12.5
30	32	DSM	9,755	9.0	100.0	Netherlands	965	28.4	100.0	9.9	14,467	100.0	6.7
31	33	Asahi Kasei	9,703	11.3	53.3	Japan	1,088	44.3	53.6	11.2	11,884	56.8	9.2
32	31	Eastman Chemical	9,549	6.0	100.0	U.S.	1,540	7.8	100.0	16.1	15,999	100.0	9.6
33	36	Arkema	9,409	10.5	100.0	France	1,014	28.9	100.0	10.8	10,822	100.0	9.4
34	30	Syngenta	9,244	-2.4	73.1	Switzerland	na	na	na	na	na	na	na
35	37	Chevron Phillips Chemical	9,063	7.2	100.0	U.S.	na	na	na	na	16,767	100.0	na
36	38	Borealis	8,548	4.8	100.0	Austria	884	-16.3	100.0	10.3	10,617	100.0	8.3
37	41	Indorama	8,443	12.5	100.0	Thailand	635	47.4	100.0	7.5	8,326	100.0	7.6
38	44	SK Innovation	8,272	21.5	20.2	South Korea	1,220	49.9	42.6	14.7	na	na	na
39	29	Huntsman	8,208	-15.0	100.0	U.S.	876	44.6	100.0	10.7	10,244	100.0	8.6
40	35	Air Products & Chemicals	8,188	-4.3	100.0	U.S.	1,661	-10.9	100.0	20.3	18,467	100.0	9.0
41	40	Ecolab <sup>g</sup>	8,078	5.6	58.4	U.S.	1,061	2.0	52.5	13.1	na	na	na
42	—	Westlake Chemical	8,041	58.4	100.0	U.S.	1,341	116.6	100.0	16.7	12,076	100.0	11.1
43	—	Wanhua Chemical	7,862	76.5	100.0	China	2,510	200.1	100.0	31.9	9,742	100.0	25.8
44	39	Sasol	7,743	-1.9	59.7	South Africa	1,175	-0.9	49.3	15.2	17,878	60.5	6.6
45	42	Mosaic	7,409	3.4	100.0	U.S.	542	7.1	100.0	7.3	18,633	100.0	2.9
46	47	PTT Global Chemical	7,385	15.5	56.9	Thailand	956	24.3	74.7	12.9	8,831	68.9	10.8
47	46	Tosoh	7,340	10.7	100.0	Japan	1,165	17.4	100.0	15.9	7,608	100.0	15.3
48	45	DIC	7,042	5.1	100.0	Japan	504	4.2	100.0	7.2	7,420	100.0	6.8
49	43	Hanwha Chemical <sup>g</sup>	6,858	-0.5	70.9	South Korea	571	-5.7	86.6	8.3	na	na	na
50	48	Clariant	6,479	9.1	100.0	Switzerland	399	-7.7	100.0	6.2	8,361	100.0	4.8

**Note:** Some figures converted at 2017 average exchange rates of U.S. \$1.00 = 3.191 Brazilian reais, 6.7569 Chinese renminbi, 0.8849 euros, 65.07 Indian rupees, 112.1 Japanese yen, 1129.04 Korean won, 8.2679 Norwegian kroner, 3.75 Saudi riyals, 13.2943 South African rand, 0.9842 Swiss francs, 30.402 New Taiwan dollars, and 33.913 Thai baht. **a** Prior-year rankings have been revised from the July 24, 2017, issue of C&EN to reflect restated prior-year results and changes in exchange rates. **b** Sales less administrative expenses and cost of sales. **c** Operating profit as a percentage of sales. **d** Chemical operating profit as a percentage of identifiable assets. **e** Sales include a significant amount of nonchemical products. **f** Prior-year figures are for Dow Chemical. **g** C&EN estimates. **h** Figures are through Aug. 31, 2017, when the company merged with Dow Chemical to form DowDuPont. **na** = not available.



agreement to sell Praxair's European business, which had \$1.5 billion in annual sales, to Taiyo Nippon Sanso. Linde also signed a deal under which the private equity firm CVC Capital Partners and the German industrial gas maker Messer will buy Linde's U.S. gas business and some of its South American assets for \$3.3 billion.

## 15 Toray Industries

► **2017 chemical sales:** \$16.9 billion  
Toray Industries continues to invest big in its core carbon fiber composites business. It is paying \$1.15 billion for TenCate Advanced Composites, which specializes in carbon fiber prepreg—carbon fiber impregnated with resin—for the production of small and medium aircraft. However, the Japanese firm has recently been hit by scandal. Late last year, the company fessed up to faking quality-control measurements on out-of-spec industrial fiber. Toray claims that it missed quality specifications by an insignificant amount.

## 16 AkzoNobel

► **2017 chemical sales:** \$16.5 billion  
After rejecting a \$28 billion takeover offer from paint rival PPG Industries, AkzoNobel management promised to spin off its specialty chemical unit, which analysts said would raise between \$8 billion and \$12 billion. Akzo exceeded these expectations, inking an agreement in March to sell the

expected it to: It attempted to negotiate the purchase of Axalta Coating Systems, DuPont's former paint business. Axalta abandoned those talks to focus on overtures from Nippon Paint, which likewise yielded no deal.

## 17 Evonik Industries

► **2017 chemical sales:** \$16.3 billion  
As part of a restructuring, Evonik Industries is cutting 1,000 jobs—mostly in administration and sales and much of them in its home country of Germany. The company aims to save \$230 million annually. Evonik is also exploring the sale of its methacrylates unit, which isn't growing at the pace of other businesses, such as animal nutrition and specialty additives. The company has been spending generously on expansion. It will spend nearly \$500 million on a plant in Marl, Germany, for nylon 12 and precursors by 2021. It is also laying out \$120 million to build a precipitated silica plant in Charleston, S.C., and \$50 million to expand fumed silica capacity in Antwerp, Belgium. The company completed the \$3.8 billion purchase of Air Products' specialty chemical business, its largest deal ever, in 2017.

## 18 Covestro

► **2017 chemical sales:** \$16.0 billion  
Covestro's last tie to its former parent, Bayer, is nearly severed: Bayer's ownership stake in Covestro is down to 6.8%. Covestro also has a new CEO. Former chief commercial officer Markus Steilemann took the helm last month from Patrick Thomas, who is soon to be nonexecutive chair of Johnson Matthey. Otherwise, Covestro has been rolling out modest investments. The company is also spending about \$235 million to expand methylene diphenyl diisocyanate capacity and build a new chlorine plant at that site. For that new plant, the German company is installing an oxygen-depolarized cathode that will allow it to make chlorine and caustic soda without coproduct hydrogen, saving energy.

ing a purchase of a majority stake in the firm from Brazilian conglomerate Odebrecht. A report in Brazil suggests that the parties may come to terms on a deal in October and that the transaction may include Braskem's minority shareholder, state oil company Petrobras. Braskem was founded in 2002 following a government auction of a plant in Camaçari, Brazil, and went on to consolidate almost the entire Brazilian petrochemical industry over the following decade. It also expanded overseas, building a cracker complex in Mexico and buying out polypropylene businesses from Dow Chemical and Sunoco. However, a massive corruption scandal ensnared the company and its owners, who are now seeking a sale to raise money.

## 20 PPG Industries

► **2017 chemical sales:** \$14.8 billion  
PPG Industries' \$28 billion offer last year to acquire AkzoNobel was rejected, and a hostile takeover was impossible given the peculiarities of Akzo's corporate structure. To date, PPG hasn't mounted another offensive against its Dutch rival, falling back instead to the peacetime duties of running its businesses and distributing cash to shareholders. In a high-tech development, it is partnering with the start-up SiNode Systems to manufacture high-energy anode materials for lithium-ion batteries. The silicon-graphene materials make for higher-capacity, faster-charging batteries, the partners say.

## 21 Sumitomo Chemical

► **2017 chemical sales:** \$14.6 billion  
The past year has seen Sumitomo Chemical rack up many small acquisitions. It purchased a 20% stake in the Japanese biotech firm Bonac, which is developing nucleic acid drug candidates. In agriculture, it bought Kyowa Hakko Bio's plant growth regulator business. Sumitomo also acquired control of Botanical Resources Australia, a Tasmanian firm that extracts pyrethrins, used as organic insecticides, from Dalmatian chrysanthemum. In an organic growth initiative of its own, Sumitomo is spending \$150 million to establish a semiconductor materials facility in Changzhou, China.

## 22 Lotte Chemical

► **2017 chemical sales:** \$14.1 billion  
The chemical arm of the South Korean conglomerate Lotte has nearly completed the most ambitious U.S. project



**Johan Landfors, executive committee member responsible for polymer chemistry at AkzoNobel, participates in the groundbreaking for an organic peroxides plant in China.**

business to the Carlyle Group, a private equity firm, for \$12.5 billion. The specialty chemical business generated \$5.6 billion in sales in 2017, which wouldn't have been enough to make C&EN's ranking on its own. Akzo also did what many observers

## 19 Braskem

► **2017 chemical sales:** \$15.4 billion  
Brazil's petrochemical giant may soon cease to exist as an independent company. LyondellBasell Industries is negotiat-

ever undertaken by a Korean chemical firm. The company's \$3 billion ethylene joint venture with Westlake Chemical in Lake Charles, La., is scheduled to start up during the first half of next year.

The timing of the facility is just as the companies predicted when they broke ground in June 2016. Lotte is also constructing its own ethylene glycol plant in Lake Charles.

## Spending

Asian firms LG Chem and Sinopec more than doubled capital spending in 2017.

	CHEMICAL CAPITAL SPENDING			CHEMICAL R&D SPENDING		
	2017 (\$ MILLIONS)	% CHANGE FROM 2016	% OF CHEMICAL SALES	2017 (\$ MILLIONS)	CHANGE FROM 2016	% OF CHEMICAL SALES
Air Liquide	\$2,323	-5.5%	10.3%	\$330	1.4%	1.5%
Air Products & Chemicals	1,040	-1.5	12.7	58	-56.2	0.7
AkzoNobel	693	-3.3	4.2	na	na	na
Arkema	519	3.1	5.5	266	5.9	2.8
Asahi Kasei	507	20.3	5.2	na	na	na
BASF	3,815	-45.0	5.5	2,082	1.0	3.0
Bayer	757	-13.3	7.0	1,318	0.2	12.2
Borealis	512	36.1	6.0	156	21.1	1.8
Braskem	712	-19.9	4.6	52	3.4	0.3
Clariant	252	-16.5	3.9	214	2.4	3.3
Covestro	585	23.6	3.7	310	5.8	1.9
DIC	282	1.1	4.0	111	10.9	1.6
DowDuPont <sup>a</sup>	3,570	-6.2	5.7	2,110	33.2	3.4
DSM	507	8.7	5.2	377	8.1	3.9
DuPont <sup>b</sup>	687	-32.6	4.0	1,064	-29.2	6.2
Eastman Chemical	649	3.7	6.8	215	-1.8	2.3
Evonik Industries	1,175	9.7	7.2	518	4.6	3.2
ExxonMobil	3,349	72.2	11.7	na	na	na
Huntsman	282	-33.0	3.4	138	-9.2	1.7
Indorama	583	47.4	6.9	12	12.7	0.1
Lanxess	618	24.6	5.7	164	10.7	1.5
LG Chem	1,536	334.1	6.6	771	28.3	3.3
Linde	1,980	5.5	11.7	82	-3.9	0.5
Lotte Chemical	1,789	27.2	12.7	81	44.3	0.6
LyondellBasell Industries	1,323	-34.0	4.7	106	7.1	0.4
Mitsubishi Chemical	1,711	10.6	6.5	na	na	na
Mitsui Chemicals	710	78.8	6.0	298	8.4	2.5
Mosaic	820	-2.7	11.1	na	na	na
PPG Industries	360	-10.4	2.4	453	-2.8	3.1
Praxair	1,311	-10.5	11.5	93	1.1	0.8
Reliance Industries	1,376	-58.5	7.8	na	na	na
SABIC	2,959	-23.9	7.9	301	-43.9	0.8
Sasol	3,553	-12.6	45.9	na	na	na
Shin-Etsu Chemical	1,573	21.0	12.2	461	5.5	3.6
Sinopec	3,408	160.2	6.2	na	na	na
Solvay	799	-19.9	6.5	328	-4.9	2.7
Sumitomo Chemical	1,077	15.7	7.4	na	na	na
Toray Industries	1,264	-1.9	7.5	na	na	na
Tosoh	352	4.6	4.8	138	7.6	1.9
Wanhua Chemical	881	44.7	11.2	183	70.5	2.3
Westlake Chemical	577	-8.3	7.2	na	na	na
Yara	1,334	-14.3	11.8	45	18.9	0.4

**Note:** Figures are for companies on page 39 reporting capital and/or R&D expenditures. **a** Prior-year figures are for Dow Chemical. **b** Figures are through Aug. 31, 2017, when the company merged with Dow Chemical to form DowDuPont. **na** = not available.

## 23 Shin-Etsu Chemical

► **2017 chemical sales:** \$12.9 billion  
Shin-Etsu Chemical, like many Japanese chemical firms, had an exceptional year in 2017. Its profits shot up by more than 40%, and sales rose 17%. Shin-Etsu credited strong performance in polyvinyl chloride and electronic materials. Looking for more growth, Shin-Etsu is investing \$175 million to expand cellulose derivatives in Japan and Germany. It will also lay out \$21 million to boost silicones in Akron, Ohio.

## 24 Solvay

► **2017 Chemical Sales:** \$12.3 billion  
In recent years, Solvay has divested some of its traditional chemical businesses, like vinyls and cellulose acetate, in favor of specialty chemicals. In the latest such move, the Belgian company inked an agreement to sell its nylon 6,6 business to BASF for \$1.9 billion. The European Commission is investigating that deal because of fears over BASF's resulting large market share in engineering polymers. The transition to specialties also spurred a reorganization of R&D. The company is cutting about 600 jobs, though it won't say how many are scientists. It is also transferring some 500 employees from Paris and Aubervilliers, France, to Lyon, France, and Brussels.

More  
online

For an interactive graphic of the Global Top 50 data as well as 25 more company capsules, visit [cenm.ag/2018top50](http://cenm.ag/2018top50).

## 25 Mitsui Chemicals

► **2017 chemical sales:** \$11.9 billion  
Mitsui Chemicals' dental materials business bit back earlier this year. Because of disappointing sales, Mitsui wrote off \$130 million from the value of the unit, which it bought from the German firm Heraeus in 2013 for \$576 million. Undeterred, Mitsui bought a 30% stake in B9Creations, which makes three-dimensional printers used in the jewelry industry. Mitsui wants to repurpose the machines for dental materials. Separately, the Japanese company is building a new line in Ohio for an olefinic thermoplastic elastomer. It also licensed the rights to quinofumelin—a fungicide used on fruit, vegetables, oil seeds, and rice—to Bayer. ■