



ExxonMobil's Baytown, Texas, complex, where it will install a hydrogen plant with carbon capture

## FINANCE

# C&EN's top 50 US chemical producers

The US industry enjoyed a strong rebound from the COVID-19 lockdowns even as costs rose

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**D**espite numerous difficulties, the chemical industry appears to be rebounding from the COVID-19 pandemic. C&EN's latest survey of the top 50 US chemical producers, based on fiscal year 2021, shows sales and profits up sharply.

The top 50 companies combined for \$333.6 billion in chemical sales, a 34.9% increase over what the same companies posted in 2020. And the sales figure exactly matches the record for C&EN's ranking of the top 50 firms, which was for 2011 sales.

Only three firms—Ashland, DuPont, and Ecovyst—saw sales decline, and that is because they sold major businesses recently. Additionally, many firms saw sales swell by large amounts. For example, petrochemical and plastics maker LyondellBasell Industries reported a sales increase of almost 67%. Similar firms, such as Westlake and ExxonMobil, experienced top-line increases nearly as great.

The list has a few outliers. For instance, International Flavors & Fragrances (IFF) saw chemical sales rise over 1,600%, but that was because of a mathematical quirk rather than an improvement in performance. The company merged with

DuPont's Nutrition & Biosciences business in 2021 and didn't have much of a chemical business before.

Chemical makers enjoyed brisk improvement in shipments as the economy got back into motion last year. Much of the increase in revenues, however, is due to higher costs that companies had to pass along to customers. According to the US Energy Information Administration, the average price of oil was \$39 per barrel in 2020 and \$68 in 2021. Prices for natural gas, an important source of chemical feedstocks, rose similarly. Moreover, shipping costs for chemical producers jumped because of the constrained supply chain.

By and large, chemical companies kept up with the rising

costs, and then some. Combined operating profits at the 45 top firms that report such figures for their chemical businesses rose a staggering 129.8% to hit \$56.0 billion. The numbers at some firms are difficult to believe. Westlake's profit jumped by over 1,000%, and Olin's by more than 3,500%. The largest US chemical company, Dow, saw its profit improve by more than 200%.

Looking to cut costs wherever they could in 2020, chemical companies reduced their R&D and capital spending budgets. For 2021, capital spending for the firms rose 6.0% from the year before. R&D spending declined slightly, 1.1%.

A few changes mark this year's ranking.

GCP Applied Technologies and American Vanguard didn't have enough 2021 chemical sales to make the cut. W. R. Grace was acquired by Standard Industries in September and is now private.

IFF joins the ranking at 31. Entegris makes the cut at 46. The electronic materials firm has been buying chemical businesses, notably BASF's electronic materials business last year. It is also in the process of acquiring CMC Materials, which is number 42 on the list. Goodyear Tire & Rubber, which sells some rubber to third parties, squeaks in at 50.

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The C&EN ranking includes only companies that publicly report their chemical sales figures. Some large companies, like Koch Industries and now W. R. Grace, are private and don't share that information. Other firms have sizable chemical businesses but don't break out chemical sales. For instance, PPG Industries would likely have enough sales of silicas and organic light-emitting diode materials to make the ranking.

## 1 Dow

**2021 chemical sales:** \$55.0 billion

In recent years, sustainability has become a major, if not the major, strategic theme for Dow. The company is planning a cracker in Alberta that will tap into local carbon pipeline infrastructure and become the world's first to be fired entirely by blue hydrogen, hydrogen produced from hydrocarbons while the by-product carbon dioxide is captured. The company is also cultivating technologies to electrify the cracking process so it can turn renewable electricity into process heat. It aims to demonstrate a fluidized catalytic cracking process by the end of the decade to dehydrogenate ethane. Even more audaciously, Dow CEO Jim Fitterling told a chemical conference in March that he is considering hosting small nuclear power plants at Dow sites to make carbon-free power.

## 2 LyondellBasell Industries

**2021 chemical sales:** \$39.0 billion

This May, LyondellBasell Industries is getting a new CEO, Peter Vanacker, who has led the Finnish refiner Neste since 2018. He will succeed Bob Patel, who left for the much smaller specialty chemical firm W. R. Grace. Neste and Lyondell-Basell have worked together before. Last year, after a 2-year trial, LyondellBasell agreed to use biobased feedstocks from Neste at its cracker in Wesseling, Germany, to produce polyethylene and polypropylene. The feedstocks are based on a Neste technology for making hydrocarbons out of natural fats and oils as well as chemically recycled plastics.

## 3 ExxonMobil

**2021 chemical sales:** \$36.9 billion

ExxonMobil is throwing its weight behind carbon mitigation, a direction that would have been surprising just a few years ago. It is spearheading a plan to annually capture 50 million metric tons (t) of carbon dioxide around the Houston

area and sequester it under the Gulf of Mexico. Fourteen companies have signed up for the effort. ExxonMobil is also installing a blue hydrogen plant at its Baytown, Texas, olefins cracker complex that

will reduce site emissions by 30%. Exxon-Mobil already captures and stores about 9 million t of carbon dioxide per year globally, more than any other firm. But most of that amount comes from a natural gas pro-

## Spending

**After cutting back in 2020, most companies increased their chemical capital spending and R&D budgets in 2021.**

	CHEMICAL CAPITAL SPENDING			CHEMICAL R&D SPENDING		
	2021 (\$ MILLIONS)	CHANGE FROM 2020	% OF CHEMICAL SALES	2021 (\$ MILLIONS)	CHANGE FROM 2020	% OF CHEMICAL SALES
AdvanSix	\$57	-31.5%	3.4%	\$14	18.6%	0.8%
Air Products	2,464	-1.8	23.9	94	11.4	0.9
Albemarle	954	12.1	28.7	54	-8.8	1.6
Americas Styrenics	19	-58.5	1.1	2	5.0	0.1
Ashland	105	-23.9	5.0	50	-21.9	2.4
Avient	41	32.8	1.7	n/a	n/a	n/a
Balchem	32	10.4	4.7	14	31.1	2.0
Cabot	195	-2.5	5.7	56	-1.8	1.6
Celanese	467	28.3	5.5	86	16.2	1.0
CF Industries	514	66.3	7.9	n/a	n/a	n/a
ChampionX	39	270.5	2.0	n/a	n/a	n/a
Chemours	277	3.7	4.4	107	15.1	1.7
CMC Materials	42	-66.5	3.5	54	3.6	4.5
Corteva Agriscience	336	34.4	4.6	n/a	n/a	n/a
Dow	1,501	19.9	2.7	857	11.6	1.6
DuPont	891	-25.4	5.4	618	-28.1	3.7
Eastman Chemical	555	44.9	5.3	254	12.4	2.4
Ecovyst	60	-38.2	9.8	8	-35.3	1.2
Entegris	74	35.3	10.5	n/a	n/a	n/a
ExxonMobil	1,287	-29.0	3.5	n/a	n/a	n/a
Ferro	30	-5.7	2.7	33	-8.4	2.9
FMC	100	49.0	2.0	305	5.8	6.0
Genesis Energy	227	137.8	23.3	n/a	n/a	n/a
H.B. Fuller	96	10.1	2.9	39	6.2	1.2
Huntsman	342	37.3	4.1	150	11.1	1.8
Ingevity	104	26.4	7.5	26	16.4	1.9
Innospec	39	31.6	2.6	37	21.0	2.5
International Flavors & Fragrances	139	1,885.7	6.0	n/a	n/a	na
Koppers	61	64.2	6.4	n/a	n/a	n/a
Kraton	91	22.5	4.6	40	-0.7	2.1
Kronos Worldwide	59	-6.7	3.0	17	6.3	0.9
LyondellBasell Industries	1,856	5.3	4.8	124	9.7	0.3
Minerals Technologies	52	11.2	8.9	n/a	n/a	n/a
Mosaic	1,289	10.1	10.4	n/a	n/a	n/a
NewMarket	79	-15.4	3.3	144	2.6	6.1
Occidental Petroleum	316	21.1	6.0	n/a	n/a	n/a
Olin	161	-24.7	2.2	n/a	n/a	n/a
Orion Engineered Carbons	215	48.2	13.9	22	8.9	1.4
Stepan	195	54.6	8.3	63	8.1	2.7
Trinseo	118	43.0	2.4	64	5.8	1.3
Tronox	272	39.5	7.6	13	8.3	0.4
Westlake	567	22.7	6.5	n/a	n/a	n/a

**Sources:** Company documents, C&EN analysis. **Note:** Figures are for companies on the top 50 list reporting capital and/or R&D expenditures. n/a means not available.

# Top 50 US chemical firms

Coming out of pandemic-depressed 2020, chemical companies saw ginormous increases in sales and profits.

RANK		COMPANY	CHEMICAL SALES (\$ MILLIONS)	CHANGE FROM 2020	CHEMICAL SALES AS % OF TOTAL SALES	SECTOR	CHEMICAL OPERATING PROFIT <sup>b</sup> (\$ MILLIONS)	CHANGE FROM 2020	OPERATING PROFIT MARGIN <sup>c</sup>	HEADQUARTERS	IDENTIFIABLE CHEMICAL ASSETS (\$ MILLIONS)	OPERATING RETURN ON CHEMICAL ASSETS <sup>d</sup>
2021	2020 <sup>a</sup>											
1	1	Dow	\$54,968	42.6%	100.0%	Diversified	\$7,887	208.6%	14.3%	Midland, Michigan	\$62,990	12.5%
2	2	LyondellBasell Industries	38,995	66.6	84.5	Petrochemicals	8,009	172.6	20.5	Houston	n/a	n/a
3	3	ExxonMobil	36,858	59.6	13.3	Petrochemicals	9,960	272.3	27.0	Irving, Texas	39,722	25.1
4	4	DuPont	16,653	-18.4	100.0	Diversified	2,652	59.7	15.9	Wilmington, Delaware	45,707	5.8
5	8	Chevron Phillips Chemical	14,104	67.1	100.0	Petrochemicals	n/a	n/a	n/a	The Woodlands, Texas	17,777	n/a
6	6	Mosaic	12,357	42.3	100.0	Fertilizers	2,770	299.5	22.4	Tampa, Florida	22,036	12.6
7	7	Eastman Chemical	10,476	23.6	100.0	Diversified	1,451	32.5	13.9	Kingsport, Tennessee	15,519	9.3
8	5	Air Products <sup>e</sup>	10,323	16.6	100.0	Industrial gases	2,215	3.6	21.5	Allentown, Pennsylvania	26,859	8.2
9	14	Westlake	8,670	58.6	73.6	Petrochemicals	2,549	1,003.5	29.4	Houston	11,938	21.4
10	13	Celanese	8,537	51.0	100.0	Diversified	1,938	171.0	22.7	Irving, Texas	11,975	16.2
11	12	Huntsman	8,256	39.9	100.0	Diversified	774	307.4	9.4	The Woodlands, Texas	9,392	8.2
12	17	Olin	7,327	51.7	82.2	Chlorine chemistry	1,614	3,544.0	22.0	Clayton, Missouri	7,492	21.5
13	9	Corteva Agriscience	7,253	12.3	46.3	Agrochemicals	825	32.0	11.4	Indianapolis, Indiana	12,428	6.6
14	19	CF Industries	6,538	58.5	100.0	Fertilizers	2,164	263.7	33.1	Deerfield, Illinois	12,375	17.5
15	11	Lubrizol	6,500	9.2	100.0	Specialties	490	-51.0	7.5	Wickliffe, Ohio	n/a	n/a
16	15	Chemours	6,345	27.7	100.0	Diversified	682	52.6	10.7	Wilmington, Delaware	7,550	9.0
17	10	Ecolab <sup>f</sup>	6,305	5.8	49.5	Process services	1,031	-6.8	16.4	Saint Paul, Minnesota	n/a	n/a
18	16	Honeywell International	5,402	11.8	15.7	Fluorochemicals	n/a	n/a	n/a	Charlotte, North Carolina	n/a	n/a
19	20	Occidental Petroleum	5,246	40.5	20.2	Petrochemicals	1,544	132.5	29.4	Houston	4,671	33.1
20	18	FMC	5,045	8.7	100.0	Agrochemicals	1,153	11.5	22.9	Philadelphia	10,581	10.9
21	22	Trinseo	4,828	59.0	100.0	Polymers	376	494.1	7.8	Berwyn, Pennsylvania	4,712	8.0
22	24	Tronox	3,572	29.5	100.0	Pigments	577	110.6	16.2	Stamford, Connecticut	5,987	9.6
23	25	Cabot <sup>g</sup>	3,409	30.4	100.0	Specialties	454	200.7	13.3	Boston	3,306	13.7
24	21	Albemarle	3,328	6.4	100.0	Specialties	503	-0.7	15.1	Charlotte, North Carolina	10,974	4.6
25	23	H.B. Fuller <sup>h</sup>	3,278	17.5	100.0	Specialties	253	15.7	7.7	Saint Paul, Minnesota	4,275	5.9
26	26	Hexion <sup>h</sup>	2,550	1.6	100.0	Specialties	237	426.7	9.3	Columbus, Ohio	3,784	6.3
27	28	Avantor	2,548	24.7	34.5	Laboratory chemicals	n/a	n/a	n/a	Radnor, Pennsylvania	n/a	n/a
28	34	Avient <sup>f</sup>	2,392	59.8	49.6	Pigments	303	67.6	12.7	Avon Lake, Ohio	2,965	10.2
29	29	NewMarket	2,356	17.2	100.0	Fuel additives	258	-17.3	10.9	Richmond, Virginia	2,558	10.1
30	30	Stepan	2,346	25.5	100.0	Detergents	181	-0.9	7.7	Northbrook, Illinois	2,066	8.8
31	—	International Flavors & Fragrances	2,329	1,638.1	20.0	Food additives	272	6,700.0	11.7	New York City	14,774	1.8
32	27	Ashland <sup>e</sup>	2,111	-9.2	100.0	Specialties	172	28.4	8.1	Wilmington, Delaware	6,612	2.6
33	42	ChampionX <sup>f</sup>	1,984	88.1	64.5	Oil field chemicals	196	122.2	9.9	The Woodlands, Texas	n/a	n/a
34	33	Kraton	1,970	26.0	100.0	Polymers, pine chemicals	258	272.4	13.1	Houston	2,655	9.7
35	32	Kronos Worldwide	1,939	18.3	100.0	Pigments	197	48.8	10.2	Dallas	2,013	9.8
36	40	Americas Styrenics	1,822	63.3	100.0	Polymers	205	136.6	11.3	The Woodlands, Texas	702	29.2
37	37	AdvanSix	1,685	45.5	100.0	Polymers	191	203.8	11.3	Parsippany, New Jersey	1,312	14.6
38	38	Orion Engineered Carbons	1,547	36.1	100.0	Inorganics	154	60.6	10.0	Houston	1,631	9.5
39	36	Innospec	1,483	24.3	100.0	Fuel additives	130	74.2	8.8	Englewood, Colorado	1,571	8.3
40	35	Ingevity	1,392	14.4	100.0	Pine chemicals	307	4.7	22.1	North Charleston, South Carolina	2,469	12.4
41	43	3M	1,205	16.3	3.4	Fluorochemicals	n/a	n/a	n/a	Saint Paul, Minnesota	n/a	n/a
42	39	CMC Materials <sup>e</sup>	1,200	7.5	100.0	Electronic materials	215	-1.9	17.9	Aurora, Illinois	2,151	10.0
43	44	Ferro	1,126	17.4	100.0	Pigments	127	38.9	11.3	Mayfield Heights, Ohio	1,290	9.8
44	46	Genesis Energy	973	9.9	45.8	Inorganics	167	28.2	17.1	Houston	2,133	7.8
45	45	Koppers	949	4.3	56.5	Coal tar chemicals	143	27.8	15.0	Pittsburgh	1,034	13.8
46	—	Entegris <sup>f</sup>	711	16.7	30.9	Electronic materials	168	31.1	23.6	Billerica, Massachusetts	1,192	14.1
47	47	Balchem	670	13.0	83.8	Nutritional ingredients	102	11.8	15.3	New Hampton, New York	886	11.5
48	41	Ecovyst	611	-44.8	100.0	Inorganics	79	-46.7	12.9	Malvern, Pennsylvania	1,931	4.1
49	49	Minerals Technologies	579	13.3	31.2	Inorganics	73	7.5	12.6	New York City	606	12.0
50	—	Goodyear Tire & Rubber	569	79.5	5.7	Polymers	n/a	n/a	n/a	Akron, Ohio	n/a	n/a

Sources: Company documents, C&EN analysis. Note: n/a means not available. a Prior-year ranking has been restated to reflect the inclusion of only chemical producing segments at Westlake following nonchemical acquisitions. b Chemical sales minus administrative expenses and cost of sales. c Chemical operating profit as a percentage of chemical sales. d Chemical operating profit as a percentage of identifiable chemical assets. e Fiscal year ended Sept. 30, 2021. f Chemical sales include a significant amount from nonchemical products. g Fiscal year ended Nov. 27, 2021. h Figures are for the first 9 months because the company was acquired in early 2022 and didn't publish an annual report.

cessing facility in Wyoming that captures CO<sub>2</sub> coming out of the ground along with the gas. The CO<sub>2</sub> is subsequently used for enhanced oil recovery.

## 4 DuPont

**2021 chemical sales:** \$16.7 billion

CEO Ed Breen's campaign to transform DuPont isn't quite finished. In its second large acquisition in electronics, the company is buying Rogers, which makes materials such as laminates for printed circuit boards, for \$5.2 billion. Last July, DuPont acquired Laird Performance Materials—a specialist in electronics-shielding materials—for \$2.3 billion. The company will more than pay for these purchases by selling its engineering polymer franchise, one of its oldest businesses, to Celanese for \$11 billion. The business makes nylon, polybutylene terephthalate, and other plastics and had sales in 2021 of about \$3.5 billion.

## 5 Chevron Phillips Chemical

**2021 chemical sales:** \$14.1 billion

Chevron Phillips Chemical, a joint venture between Phillips 66 and Chevron, is on a construction spree. The company is building a propylene splitter—which separates refinery propylene from propane—at its complex in Baytown, Texas. In Old Ocean, Texas, it is building a facility for 1-hexene, a comonomer used in linear low-density polyethylene. And later this year, Chevron Phillips and partner QatarEnergy will decide whether to move forward on an ethylene cracker on the US Gulf Coast.

## 6 Mosaic

**2021 chemical sales:** \$12.4 billion

Business for Mosaic has been booming: average selling prices for the two major fertilizers it makes—potash and phosphates—nearly doubled in 2021 versus 2020. This has been a pattern across the fertilizer industry and, indeed, across most major global commodities as the world climbs out of the COVID-19 pandemic and deals with the war in Ukraine. In this environment, Mosaic's operating profits rose nearly 300% in 2021, and its sales increased 42%.

## 7 Eastman Chemical

**2021 chemical sales:** \$10.5 billion

At an event hosted by French president Emmanuel Macron at Elysée Palace in January, Eastman Chemical CEO Mark Costa unveiled a \$1 billion project to build a polyester depolymerization complex in France. The plant will use methanolysis to break

postconsumer polyethylene terephthalate (PET) into its raw materials, dimethylene terephthalate and ethylene glycol. The company will open a similar, though smaller, plant at its headquarters complex in Kingsport, Tennessee, by the end of this year. Eastman exited the PET production business a decade ago. It will use the raw materials to make high-end polyester copolymers such as Tritan, a clear polyester often used as a substitute for polycarbonate.

## 8 Air Products

**2021 chemical sales:** \$10.3 billion

Air Products is doubling down on efforts to be a sustainable hydrogen supplier. It is planning the world's biggest blue hydrogen complex, a \$4.5 billion project in Ascension Parish, Louisiana, set to be completed in 2026. The company will sequester up to 5 million metric tons annually of the carbon dioxide produced at the plant in geological pore spaces 1.6 km underground. Air Products is working on a similar project in Alberta expected to cost about \$1.1 billion.

## 9 Westlake

**2021 chemical sales:** \$8.7 billion

Westlake Chemical changed its name to Westlake, dropping "Chemical" after a spate of acquisitions, mostly in construction products largely made from polyvinyl chloride (PVC) resin, its core business. It bought the North American building product business of Boral for \$2.1 billion in October. It also bought the PVC product makers Lasco and Dimex. The company did make a major acquisition in chemicals. In February, it completed the purchase of Hexion's epoxy resin unit for \$1.2 billion, a deal that will give it about \$1.5 billion in sales of products such as epichlorohydrin and bisphenol A.

## 10 Celanese

**2021 chemical sales:** \$8.5 billion

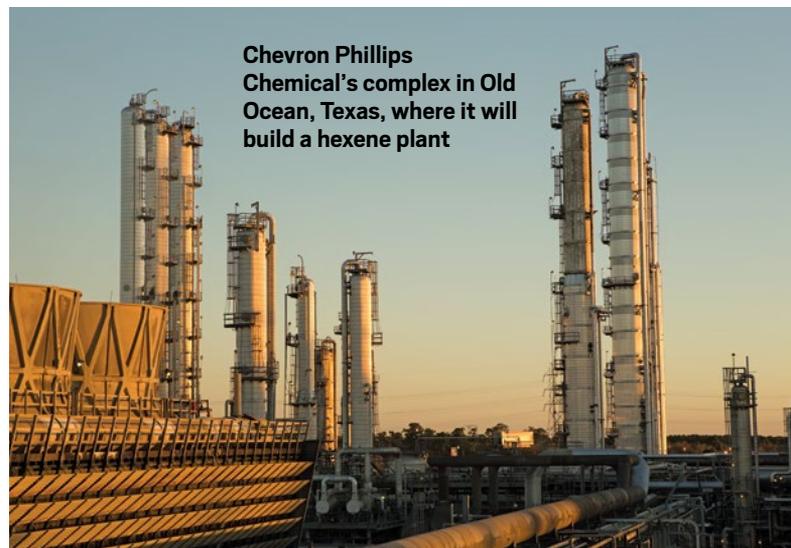
Flush with cash from selling its stake in the Polyplastics engineering plastics joint venture to its partner Daicel, Celanese has turned to making acquisitions. In

December, it bought ExxonMobil's Santoprene elastomer business for \$1.2 billion. Then in February, it agreed to purchase DuPont's engineering plastics business for \$11 billion. The acquisition will include DuPont's sizable nylon and polybutylene terephthalate operations and strengthen Celanese's business in compounding those polymers. Polyacetal, a polymer that both Celanese and DuPont make, was left out of the transaction.

## 11 Huntsman

**2021 chemical sales:** \$8.3 billion

Huntsman recently fended off a challenge from Starboard Value, an activist investment firm that in recent years has also dogged chemical companies such as Corteva Agriscience and GCP Applied Technologies. Starboard owned 8.6% of



**Chevron Phillips Chemical's complex in Old Ocean, Texas, where it will build a hexene plant**

Huntsman stock when it criticized Huntsman management, complaining about the firm's pattern of setting lofty earnings targets and subsequently missing them. Starboard nominated four directors for Huntsman's board, including James L. Gallogly, former CEO of LyondellBasell Industries, and Sandra Beach Lin, a former Celanese executive. But shareholders voted down the Starboard candidates at Huntsman's March 25 shareholders meeting.

## 12 Olin

**2021 chemical sales:** \$7.3 billion

The chlor-alkali company's profits jumped more than 3,500% in 2021, perhaps a testament to a program of finding less-efficient production lines to shut down. By the end of this year, Olin will have closed more than 800,000 metric tons (t) of chlorine and 880,000 t of caustic soda capacity

that was based on older diaphragm technology at its sites in McIntosh, Alabama, Freeport, Texas, and Plaquemine, Louisiana. The company is also shutting down bleach capacity in California. Earlier this year, it idled an epoxy plant in Stade, Germany, that had been running at less than 50% of capacity. Demand for epoxy resins has been slow in Europe, the company explained in an announcement, and the situation was “exacerbated by the uncertainty following the Russian invasion of Ukraine.”

## 13 Corteva Agriscience

**2021 chemical sales:** \$7.3 billion

James C. Collins Jr. retired as CEO of Corteva Agriscience last year after a challenge from the activist investor Starboard Value, which alleged that Corteva underperformed after spinning off from Dow-DuPont. To replace him, the agrochemical maker's board hired Chuck Magro, who had led fertilizer maker Nutrien, as well as its predecessor Agrium, for 7 years. Corteva had to pay Nutrien an \$18.7 million fee to free Magro from contracts with Nutrien.

## 14 CF Industries

**2021 chemical sales:** \$6.5 billion

The results at CF Industries, the world's largest producer of ammonia, offer a window into the health of the booming nitrogen fertilizer industry. CF's sales increased nearly 60% in 2021, its profit swelled by more than 260%, and its operating profit margin hit 33%, the highest among the companies in C&EN's ranking. But high nitrogen fertilizer prices weren't enough to keep up with escalating costs in Europe toward the end of 2021. The company curtailed production in the UK temporarily as local costs of natural gas—the major input in ammonia production—nearly quintupled last year.

## 15 Lubrizol

**2021 chemical sales:** \$6.5 billion

A new CEO took over abruptly in August when Chris Brown replaced Eric Schnur at the Berkshire Hathaway-owned specialty chemical company. Brown, a veteran of the energy infrastructure industry, had led Berkshire Hathaway Energy Infrastructure for about a year. Schnur had run Lubrizol since 2017. Schnur was retained in an advisory role, implying the sudden change doesn't necessarily mean he left on bad terms. And then, this past March, Lubrizol appointed another CEO, Mary Rhinehart, Lubrizol's chair, to replace Brown on an interim basis. In its



**H.B. Fuller has a partnership with Gorilla Glue for professional-grade adhesives and other products.**

statement, Lubrizol said that Brown had been brought on temporarily to improve the company's safety and operating performance. Last June, a Lubrizol lubricants plant in Rockton, Illinois, caught fire.

## 16 Chemours

**2021 chemical sales:** \$6.3 billion

Chemours made a couple of notable moves over the past year. In December, it sold its sodium cyanide business to the Czech cyanide maker Draslovka Holding for \$520 million. Chemours had about \$200 million in annual sales from the chemical, which is used to extract gold and silver from ore. Separately, Chemours is building a plant in Arkansas to make HFO-1336mzzE, a hydrofluoroolefin used as a foam-blowing agent.

## 17 Ecolab

**2021 chemical sales:** \$6.3 billion

In a maneuver meant to bolster its business in health care and the life sciences, Ecolab purchased Purolite in December for \$3.7 billion. Purolite makes ion-exchange resins for aqueous separations, and pharmaceutical applications represent roughly 40% of its annual sales of about \$400 million. Ecolab's own emphasis in water treatment has been on industrial sectors, and life sciences represented only about 10% of its revenues.

## 18 Honeywell International

**2021 chemical sales:** \$5.4 billion

Multiple small companies are piling into pyrolysis, developing plants that will convert mixed plastic waste into synthetic crude oil or even feedstocks for more plastics. Now Honeywell International, a big-time developer and licensor of chemical and refining technologies, has gotten into

the act with its UpCycle Process Technology. The company says the process can reduce the carbon dioxide emissions from plastics production by 57% over using fossil raw materials. Honeywell is working with the Spanish infrastructure firm Sacry to build an UpCycle plant in Spain and with the recycling firm Avangard Innovative on a similar facility in Texas.

## 19 Occidental Petroleum

**2021 chemical sales:** \$5.2 billion

In August, Occidental Petroleum decided to close a plant in Niagara Falls, New York, where it produced chlorine, caustic soda, hydrochloric acid, and sodium hypochlorite. The firm says it tried to keep the century-old facility running, but escalating costs and bad market conditions were too much to overcome. The facility is best known for its association with the Love Canal environmental disaster. Occidental predecessor Hooker Chemical started dumping toxic waste in the canal in the 1920s and filled the site with dirt in the 1950s. After the contamination was discovered in the 1970s, residents living nearby were evacuated. An Occidental affiliate will continue to oversee the property.

## 20 FMC

**2021 chemical sales:** \$5.0 billion

In recent years, FMC has transformed itself from a diversified specialty chemical maker into a pure-play crop protection firm. Late last year, the company set one of the most ambitious carbon dioxide emission reduction targets in the chemical industry: net zero by 2035. Most companies that have set a carbon neutrality target aim to do so by 2050. And FMC had previously pledged to reduce emissions by 25% by 2035. It will reach net-zero by improving efficiency, investing in renewable

energy, and engaging with its suppliers to reduce the emissions of the products and services it procures.

## 21 Trinseo

**2021 chemical sales:** \$4.8 billion

Trinseo has been undertaking one of the most sweeping portfolio restructurings in the chemical industry. In November, the polymer maker announced plans to sell one of its major businesses: polystyrene. The business includes Trinseo's European and Asian polystyrene and styrene operations, which had annual revenues of about \$1.4 billion in 2021, and its 50% stake in Americas Styrenics, a polystyrene joint venture with Chevron Phillips Chemical that had sales of \$1.8 billion last year. Trinseo sold its synthetic rubber unit to Polish competitor Synthos in December. Last year, Trinseo bought both Aristech Surfaces and Arkema's polymethyl methacrylate business.

## 22 Tronox

**2021 chemical sales:** \$3.6 billion

Tronox lost a lawsuit against Venator in April and now must pay the firm, a competitor in the titanium dioxide business,

\$75 million. The litigation stems from Tronox's sale of a TiO<sub>2</sub> plant in Ashtabula, Ohio, to Ineos, a disposal that Tronox needed to win regulatory clearance of its acquisition of another competitor, Cristal. Venator said it had its own deal to buy the plant from Tronox before Ineos did. As a result, Tronox is on the hook for the breakup fee the firms agreed to at the outset of the deal.

## 23 Cabot

**2021 chemical sales:** \$3.4 billion

Sometimes investments don't pan out. That was the case in 2012, when Cabot bought the activated carbon maker Norit for \$1.1 billion. Cabot was betting that activated carbon would be in high demand for scrubbing mercury from the emissions of coal-fired power plants. The timing couldn't have been worse. The shale revolution lowered natural gas prices, prompting power companies to convert from coal to gas. In December, Cabot signed an agreement to sell the business to One Equity Partners for \$111 million.

## 24 Albemarle

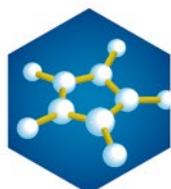
**2021 chemical sales:** \$3.3 billion

After the sale last June of its fine chemical business to W. R. Grace, Albemarle became more focused on its lithium business. In July, it opened a lithium-ion battery materials R&D center in Kings Mountain, North Carolina. It agreed in September to purchase the Chinese lithium carbonate and hydroxide producer Guangxi Tianyuan New Energy Materials for about \$200 million. And it recently started working with the start-up 6K to develop materials for high-performance batteries.

## 25 H.B. Fuller

**2021 chemical sales:** \$3.3 billion

In a portent that it is becoming a more consumer-oriented adhesives company, H.B. Fuller has signed on Richard Rawlings as a pitch person for Gorilla Professional Grade adhesives, sealants, and lubricants, a line that Fuller developed in partnership with Gorilla Glue. Rawlings is the owner of Gas Monkey Garage, the setting for the reality show *Fast N' Loud*, in which Gas Monkey's mechanics refurbish old cars. The garage will use Gorilla thread lockers, retaining compounds, gasket sealants, instant adhesives, epoxies, urethanes, and antiseize lubricants. ■



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