



# 2019 Minerals Yearbook

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## IRON OXIDE PIGMENTS [ADVANCE RELEASE]

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# IRON OXIDE PIGMENTS

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In 2019, natural crude iron oxide pigment (IOP) production in the United States increased from that in 2018. U.S. production data were withheld to avoid disclosing company proprietary data. Finished natural and synthetic IOPs sold by processors decreased by 60% to 19,200 metric tons (t) valued at \$13.2 million in 2019 from 48,200 t valued at \$76.1 million in 2018 (table 1) owing to the closure of operations in 2018. Exports of pigment-grade iron oxides increased slightly to 11,200 t valued at \$24.8 million in 2019 compared with 11,100 t valued at \$24.0 million in 2018. Imports of natural and synthetic IOPs decreased by 11% to 159,000 t valued at \$185 million in 2019 compared with 179,000 t valued at \$206 million in 2018 (tables 1, 4, 5).

Natural IOPs are inorganic compounds that are suitable for use as pigments after milling and minimal processing. They commonly are the preferred choice of the natural minerals for pigmentation because they are low cost, inherently color stable, and nontoxic. Typically, IOPs are derived from hematite ( $\text{Fe}_2\text{O}_3$ ), which is a red iron oxide mineral; goethite or limonite ( $\text{Fe-OH}$ ), minerals that vary from yellow to brown and include ochers, siennas (yellow), and umbers (brown); and magnetite ( $\text{Fe}_3\text{O}_4$ ), a black iron oxide mineral. A wider variety of colors can be produced from natural IOPs by blending different varieties or by calcining hydrated natural IOPs.

Synthetic IOPs are used widely as colorants and compete with natural IOPs in many color applications, in part because synthetic IOPs duplicate colors more precisely and produce a substantially wider variety of colors. Synthetic IOPs are manufactured using the following three methods: precipitation of iron salts, usually accompanied by oxidation; reduction of organic compounds by iron; and thermal decomposition of iron salts or iron compounds. Organic colorants can be used for some applications, but they tend to fade over time from exposure to sunlight.

## Production

Domestic production data for natural crude IOPs were derived from voluntary responses to a U.S. Geological Survey (USGS) canvass of two domestic producers. These data were withheld from publication to avoid disclosing company proprietary data.

In another voluntary USGS survey, sales data for finished (natural and synthetic) IOPs were received from four of five known processing operations, representing more than 60% of the tonnage shown in table 1. Data for the nonrespondent were estimated based on sales in prior years and industry trends. Sales of finished pigments equaled 19,200 t in 2019, a 60% decrease from 48,200 t in 2018 (table 1). The closure of three Venator Materials PLC facilities in 2018 and reduced sales at other processing operations accounted for the significant decrease of sales in 2019 (U.S. Securities and Exchange Commission, 2019, p. 83). Sales data for finished IOPs were collected only from operations that processed material, such as the crushing and grinding of natural IOPs, or that made synthetic IOPs; these

data were not collected from operations that blended, mixed, repackaged, or resold IOP material (table 2).

Four U.S. companies, operating nine plants, produced regenerated iron oxide during steelmaking (table 2). Iron oxide is obtained during steelmaking when steel is treated with hydrochloric acid to remove surface oxides. Iron oxide is separated from the spent pickle liquor when it is treated to recycle the acid and reduce waste. One company produced iron oxide pigments mostly by recovering iron oxide from waste streams and drainage and iron-bearing waste piles from current and closed coal and iron ore mines, especially in the eastern United States. Regenerated iron oxide data were not included in table 1 because the iron oxide is not natural (mined) or synthetic (manufactured) and must undergo additional processing before being suitable for use in typical IOP applications.

Hong Kong-based Cathay Industries Group's Hoover Color Corp. (Hiwassee, VA) partnered with the Commonwealth of Virginia to transform 100 hectares (250 acres) of its mine property into a new addition to New River Trail State Park. The Hoover Mountain Bike Area was completed in 2019 and consisted of two trails (Anne, 2019). The 4-mile bike area, an extension of the New River Trail State Park, included the colorful Hoover Color Canyon Mine site, previously mined by Hoover Color (Moseley, 2018).

## Consumption

The USGS obtained end-use data through a survey of finished (natural and synthetic) IOP producers. Of the 19,200 t of finished natural and synthetic IOPs that were sold or used by processors, an estimated 46% of sales were for use in concrete and other construction products; 13% for foundry sands and other foundry uses; 6% each in animal feed and industrial coatings; 5% for paint and coatings; 3% each in plastics, and glass and ceramics; and the remaining 18% in other uses.

The leading use of IOPs was in a variety of construction materials, including concrete products such as block, brick, or segmental retaining wall units; decorative concrete; mortar; paving stones; precast products of various sizes or dimensions; ready-mixed concrete; and roofing tiles. Tinted concrete often is stamped to resemble brick, slate, stone, and many more shapes and forms found in nature, including wood (Pinto, 2008, p. 4, 6).

Another major end use for IOPs was as a tint in paints and coatings. Other end uses included colorants for ceramics, glass, paper, plastics, rubber, textiles, and in animal feed, cosmetics, and fertilizers; other-than-colorant uses in ferrites, foundry sands, industrial chemicals (such as catalysts), and magnetic ink and toner.

A significant end use for regenerated iron oxides was in ferrite ceramic magnets. Two types of ferrites are used—hard (which retain magnetism permanently) and soft (which do not). Hard ferrites are used in flexible magnets, generators, loudspeakers,

and motors. Soft ferrites are used in computers, cores for radiofrequency coils, microwave communication systems, microwave ferrites for telecommunications, and other industrial applications. Other end uses for regenerated iron oxides included color pigments in construction materials, cosmetic preparations, dyes and paints, and plastic products.

## Prices

The annual average producer price index (PPI) for IOPs (U.S. Bureau of Labor Statistics Series ID WPU06220206) was 275.7 in 2019 compared with 264.5 in 2018. The PPI measured the average change in the selling prices charged by domestic IOP producers over time. The PPI was 270.2 from January through March, 274.7 from April through June, and 278.9 from July through December (U.S. Bureau of Labor Statistics, 2020). Unit values for finished natural and synthetic IOPs reported by domestic producers ranged from \$0.40 to \$1.66 per kilogram, with an average unit value of \$0.69 per kilogram.

## Foreign Trade

U.S. exports of pigment-grade iron oxides increased slightly to 11,200 t valued at \$24.8 million in 2019, and the average unit value increased slightly (tables 1, 3). Mexico was the leading destination, accounting for 46% of United States exports; China, 16%; Belgium, 15%; Germany, 4%; and Brazil, 3%. Exports of other grades of iron oxides and hydroxides increased by 26% to 40,700 t in 2019 with a total value of \$26.2 million; the average unit value decreased by 10%. The major destinations for export of other grades of IOPs and hydroxides were Spain, 48%; Canada, 28%; China, 13%; and Mexico, 5% (table 3).

Total U.S. imports of IOPs and iron hydroxide pigments decreased by 11% to 159,000 t in 2019 from 179,000 t in 2018 (tables 1, 4). Imports of natural IOPs decreased by 65% from those in 2018 to 2,880 t. The leading source of natural IOP imports was Cyprus with 47% of the tonnage, followed by France with 32%, and Austria with 17% (table 5). Imports of synthetic IOPs decreased by 9% to 156,000 t. The leading sources of synthetic IOP imports were China with 39% of the tonnage; Germany, 37%; Brazil, 9%; and Canada and Italy, 5% each.

## World Review

Natural IOPs were produced in at least nine countries in 2019 (table 6). In addition to the countries and localities discussed in this chapter or listed in table 6, other countries may have produced natural IOPs, but available information was inadequate to make reliable estimates. Available data indicated that world production in 2019 increased by 4% to an estimated 2.96 million metric tons (Mt) from 2.84 Mt in 2018.

**Austria.**—In 2019, Kärntner Montanindustrie GmbH continued production of micaceous iron oxide (MIO) from its underground mine and nearby processing plant in Waldenstein, State of Carinthia, from which it exported some of its MIO products to the global market. Austria exported 24,000 t of IOPs in 2019, a slight decrease from the 24,500 t exported in 2018 (United Nations Statistics Division, 2020). MIOs have a horizontal layering of flaky, lamellar, “micaceous” particles that overlap like scales on a fish and give strength and corrosion

resistance to paints and coatings. Standard-grade MIOs are used on bridges, oil rigs, and other structural steel and as protective coatings on electrical and industrial equipment. Micronized grades are used in anticorrosive decorative surfaces, including water-based coatings; in prime coatings, as partial replacement of zinc dust; and in applications requiring a degree of friction (O’Driscoll, 2012).

**China.**—After 6 years of IOP imports from the United States averaging about 31,600 metric tons per year (t/yr) (reaching a high of nearly 40,000 t in 2015), imports decreased to 6,000 t in 2018 and 7,100 t in 2019 (table 3), suggesting increased production of IOPs in China to supply the demand driven by the country’s increasing construction activity. China was not included in the world production table (table 6) because IOPs produced in the country were primarily synthetic.

Lanxess AG (Germany) produced IOPs at its 25,000-t/yr red synthetic IOP plant and its 70,000-t/yr inorganic pigment mixing and milling plant at the Ningbo Chemical Park in Ningbo, Zhejiang Province. Highly saturated red and yellowish-red IOPs, referred to by the company as the “New Reds,” were produced using a patented “Ningbo Process,” developed specifically for this plant that emphasized water treatment, waste gas cleaning (including a reduction of nitrous oxides generated), and lower energy consumption (Lanxess AG, 2019b). Lanxess also operated a 38,000-t/yr IOP plant in Jinshan, Shanghai Province, where it produced black and yellow IOPs (Lanxess AG, 2019c).

**Germany.**—The Krefeld-Uerdingen synthetic iron oxide site is Lanxess’ Inorganic Pigments headquarters and the world’s largest inorganic IOP production facility. A maximum of 1,600 t of pigment can be shipped from this site daily (Lanxess AG, 2019a). Lanxess’ Bayferrox and Colortherm micronized red pigments resist color change under high shear forces and temperatures. These pigments were used in technical and colorant applications (Ondrey, 2018). In 2019, Lanxess increased the price of its Bayferrox and Colortherm brands’ yellow IOPs by 15% worldwide (Coatings World, 2019).

**India.**—India was estimated to be the world’s leading producer of IOPs in 2019 with an annual production of about 2.5 Mt of ocher (table 6). In 2019, India exported 18,600 t of IOPs, a 6% decrease from the 19,700 t exported in 2018 (United Nations Statistics Division, 2020). India has large red and yellow ocher resources, which were mined predominately in the States of Rajasthan, Andhra Pradesh, and Gujarat, in descending order of production. The IOPs were used mostly in the colorant and paint industries (Indian Bureau of Mines, 2019).

## Outlook

Consumption of IOPs follow trends in the construction and commercial and residential remodeling industries. If these industries increase, it creates higher consumption of IOPs as coloring agents in concrete products and ceramic tiles. With the continued, gradual growth of the global economy, construction activity is expected to increase over the coming years, consequently increasing the consumption of IOPs for coloring concrete, paints, and coatings.

## References Cited

- Anne, Shellie, 2019, Hoover Mountain Bike Area now open!: Richmond, VA, Virginia Department of Conservation and Recreation, April 26. (Accessed July 30, 2019, at <https://www.dcr.virginia.gov/state-parks/blog/hoover-mountain-bike-area-now-open>.)
- Coatings World, 2019, Lanxess increases prices for yellow iron oxide pigments: Montvale, NJ, Rodman Media. (Accessed July 30, 2020, at [https://www.coatingsworld.com/contents/view\\_breaking-news/2019-05-24/lanxess-increases-prices-for-yellow-iron-oxide-pigments/](https://www.coatingsworld.com/contents/view_breaking-news/2019-05-24/lanxess-increases-prices-for-yellow-iron-oxide-pigments/).)
- Indian Bureau of Mines, 2019, Ochre, in Part III—Mineral reviews (57th ed.) (advance release): Nagpur, India, Indian Minerals Yearbook 2018, v. III, June, p. 30–17–1 to 30–17–4. (Accessed September 23, 2020, at <https://ibm.gov.in/writereaddata/files/06292019105754Ochre.pdf>.)
- Lanxess AG, 2019a, Krefeld-Uerdingen - Germany: Leverkusen, Germany, Lanxess AG. (Accessed July 30, 2020, at <http://bayferrox.com/en/about-bayferrox/global-network/krefeld-uerdingen-germany/>.)
- Lanxess AG, 2019b, Ningbo: Leverkusen, Germany, Lanxess AG. (Accessed July 30, 2020, at <http://lanxess.cn/en/about-lanxess-china/locations-cn/sites/ningbo/>.)
- Lanxess AG, 2019c, Shanghai Jinshan: Leverkusen, Germany, Lanxess AG. (Accessed July 30, 2020, at <http://lanxess.cn/about-lanxess-china/locations-cn/sites/shanghai-jinshan-cn/>.)
- Moseley, Nancy, 2018, New River Trail State Park: Blacksburg, VA, New River Valley Magazine, July 16. (Accessed July 30, 2020, at <http://nrvmagazine.com/new-river-trail-state-park/>.)
- O'Driscoll, Mike, 2012, Labour costs push up micaceous iron oxide prices: Industrial Minerals, January 16. (Accessed July 30, 2020, via <http://www.indmin.com/>.)
- Ondrey, Gerald, 2018, Lanxess increases production volume of micronized iron oxide red pigments: New York, NY, Chemical Engineering, October 29. (Accessed July 30, 2020, at <https://www.chemengonline.com/lanxess-increases-production-volume-of-micronized-iron-oxide-red-pigments/>.)
- Pinto, Art, 2008, The use of iron oxides in decorative concrete, in Proceedings of iron oxide for colorant and chemical applications, New Orleans, LA, February 12–13: Portland, ME, IntertechPira Corp., 32 p. [variously paged].
- U.S. Bureau of Labor Statistics, 2020, Producer Price Index—Industry data: U.S. Bureau of Labor Statistics. (Accessed July 30, 2020, via <https://data.bls.gov/cgi-bin/srgate>.)
- U.S. Securities and Exchange Commission, 2019, Form 10-K—2018: Stockton-on-Tees, United Kingdom, Venator Materials PLC, February 19, 117 p. (Accessed August 27, 2020, at [https://otp.tools.investis.com/clients/us/venator\\_materials/SEC/sec-show.aspx?Type=html&FilingId=13241180&CIK=0001705682&Index=10000#VNTR-123118X10K\\_HTML\\_SB584090A2FC6EC8FCAB1F5612C42EEB8](https://otp.tools.investis.com/clients/us/venator_materials/SEC/sec-show.aspx?Type=html&FilingId=13241180&CIK=0001705682&Index=10000#VNTR-123118X10K_HTML_SB584090A2FC6EC8FCAB1F5612C42EEB8).)
- United Nations Statistics Division, 2020, Iron oxides and hydroxides; earth colours containing 70% or more by weight of combined iron evaluated as Fe<sub>2</sub>O<sub>3</sub>: United Nations Comtrade Database. (Accessed September 23, 2020, via <https://comtrade.un.org/data/>.)

## GENERAL SOURCES OF INFORMATION

### U.S. Geological Survey Publications

- Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140. Pigments and Fillers. Ch. in United States Mineral Resources, Professional Paper 820, 1973.

### Other

- CEH Marketing Research Report: Pigments. SRI Consulting, 2004.
- IntertechPira Corp. proceedings of conferences.
- Iron Oxide Pigments—Pt. 1.—Fine-Particle Iron Oxides for Pigment, Electronic, and Chemical Use. U.S. Bureau of Mines Information Circular 8771, 1978.
- Iron Oxide Pigments—Pt. 2.—Natural Iron Oxide Pigments—Location, Production, and Geological Description. U.S. Bureau of Mines Information Circular 8813, 1980.
- Manufacture of Different Grades of Iron Oxide—A New Experience. Iron Oxides '91 Proceedings, Falmouth Associates, Inc., 1991.
- Pigment Handbook (2d ed.). John Wiley & Sons, 1988.
- U.S. Department of Labor, Mine Safety and Health Administration

TABLE 1  
SALIENT U.S. IRON OXIDE PIGMENTS STATISTICS<sup>1</sup>

(Metric tons and thousand dollars)

	2015	2016	2017	2018	2019
<b>Crude pigments sold or used:<sup>2</sup></b>					
Quantity	W	W	W	W	W
Value	W	W	W	W	W
<b>Finished pigments sold:<sup>3</sup></b>					
Quantity	53,500	48,500	47,300	48,200	19,200
Value	\$77,900	\$71,000	\$69,200	\$76,100	\$13,200
<b>Exports:<sup>4</sup></b>					
Quantity	8,930	15,800	13,500	11,100	11,200
Value	\$17,200	\$45,600	\$36,400	\$24,000	\$24,800
<b>Imports for consumption:<sup>3</sup></b>					
Quantity	176,000	179,000	179,000	179,000	159,000
Value	\$209,000	\$197,000	\$200,000	\$206,000	\$185,000
World, production	2,660,000 <sup>r</sup>	3,200,000 <sup>r</sup>	2,350,000 <sup>r</sup>	2,840,000 <sup>r</sup>	2,960,000 <sup>c</sup>

<sup>c</sup>Estimated. <sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Table includes data through June 23, 2020. Data are rounded to no more than three significant digits.

<sup>2</sup>Mined.

<sup>3</sup>Natural (mined) and synthetic.

<sup>4</sup>Pigment grade.

TABLE 2  
PRODUCERS OF IRON OXIDE PIGMENTS AND REGENERATED IRON OXIDES  
IN THE UNITED STATES IN 2019<sup>1</sup>

Producers	Plant location
<b>Pigments:</b>	
<b>Crude:</b>	
Alabama Pigments Co., LLC	Green Pond, AL.
New Riverside Ochre Co., Inc.	Cartersville, GA.
<b>Finished:</b>	
Alabama Pigments Co., LLC	Green Pond, AL.
Dynamic Color Solutions, Inc.	Milwaukee, WI.
New Riverside Ochre Co., Inc.	Cartersville, GA.
Prince Minerals, Inc.	Quincy, IL.
Venator Materials PLC (formerly Huntsman Corp.)	Augusta, GA.
<b>Regenerator iron oxides:</b>	
American Iron Oxide Co. <sup>2</sup>	Portage, IN, and Rockport, IN.
ArcelorMittal Weirton Inc.	Weirton, WV.
Bailey-PVS Oxides, LLC	Decatur, AL, Fairfield, AL, and Delta, OH.
International Steel Services, Inc.	Burns Harbor, IN, and Warren, OH.

<sup>1</sup>Table includes data through June 23, 2020.

<sup>2</sup>Division of International Steel Services, Inc.

TABLE 3  
U.S. EXPORTS OF IRON OXIDES AND HYDROXIDES, BY COUNTRY OR LOCALITY<sup>1</sup>

Country or locality	Pigment grade				Other grade			
	2018		2019		2018		2019	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Argentina	18	\$102	7	\$27	272	\$173	658	\$653
Australia	40	174	31	51	282	483	193	486
Barbados	4	12	7	53	2	20	1	5
Belgium	1,360	8,670	1,660	9,550	217	1,410	155	1,210
Brazil	435	1,370	379	1,450	37	466	19	283
Canada	22	31	20	28	9,980	10,500	11,200	8,960
Chile	399	256	213	297	25	256	88	280
China	2,250	2,950	1,830	3,260	3,750	2,180	5,280	2,670
Colombia	94	397	95	420	28	234	5	159
Czechia	--	--	--	--	2	25	16	281
Dominican Republic	2	12	18	50	--	--	(2)	5
Ecuador	8	77	249	222	--	--	--	--
France	190	758	64	284	3	74	1	19
Germany	248	939	420	1,790	6	33	(2)	15
Guatemala	9	16	6	9	--	--	4	5
Haiti	--	--	2	4	70	242	18	37
Hong Kong	44	105	8	51	82	100	18	34
India	121	453	191	765	7	139	11	125
Indonesia	54	117	50	151	7	117	14	267
Ireland	--	--	36	35	9	84	--	--
Israel	12	36	4	36	607	187	893	256
Italy	90	191	84	196	95	19	(2)	10
Jamaica	1	5	15	33	2	4	4	9
Japan	11	75	22	68	34	38	4	10
Korea, Republic of	155	886	167	701	52	436	42	281
Malaysia	14	38	4	26	18	65	45	145
Mexico	4,470	3,370	5,120	3,630	2,600	2,030	1,990	1,980
Netherlands	30	62	32	16	(2)	12	1	54
New Zealand	2	38	18	59	60	80	76	98
Panama	--	--	--	--	10	48	3	12
Peru	8	20	4	12	1	14	1	15
Philippines	3	12	1	19	12	53	17	113
Singapore	--	--	(2)	4	11	173	21	226
South Africa	6	36	9	42	--	--	--	--
Spain	15	80	42	100	13,800	2,680	19,700	6,970
Taiwan	233	627	65	233	21	215	3	27
Thailand	347	445	61	124	2	22	3	31
Trinidad and Tobago	5	15	6	21	(2)	13	24	51
United Kingdom	353	1,430	227	763	19	160	2	38
Venezuela	--	--	14	7	(2)	7	1	5
Vietnam	(2)	6	24	48	36	116	58	105
Other	96 <sup>r</sup>	215 <sup>r</sup>	42	142	79 <sup>r</sup>	149 <sup>r</sup>	98	331
Total	11,100	24,000	11,200	24,800	32,300	23,100	40,700	26,200

<sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data through June 1, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 4  
U.S. IMPORTS FOR CONSUMPTION OF SELECTED IRON OXIDE AND HYDROXIDE PIGMENTS, BY TYPE<sup>1</sup>

Type	2018		2019		Principal sources, 2019 (metric tons)
	Quantity (metric tons)	Value <sup>2</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)	
Natural:					
Earth colors <sup>3</sup>	6,900	\$2,230	1,380	\$837	Cyprus, 1,370.
Micaceous	1,280	1,270	1,510	1,820	France, 912; Austria, 490.
Total	8,170	3,500	2,880	2,650	
Synthetic:					
Black	48,300	50,900	44,000	48,500	Germany, 21,700; China, 15,900; Italy, 4,980; Canada, 699.
Red	75,300	87,500	59,400	69,400	China, 28,000; Germany, 25,700; India, 1,780; Italy, 1,380.
Yellow	46,100 <sup>r</sup>	62,200 <sup>r</sup>	45,300	61,500	China, 17,300; Brazil, 13,900; Germany, 11,100.
Other <sup>4</sup>	845	1,610	7,340	2,620	Canada, 6,330; India, 672; China, 177.
Total	171,000	202,000	156,000	182,000	
Grand total	179,000	206,000	159,000	185,000	

<sup>r</sup>Revised.

<sup>1</sup>Table includes data through June 1, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Customs value.

<sup>3</sup>Includes those not elsewhere specified or included.

<sup>4</sup>Includes synthetic brown oxides, transparent oxides, and magnetic and precursor oxides.

Source: U.S. Census Bureau.

TABLE 5  
U.S. IMPORTS FOR CONSUMPTION OF IRON OXIDE AND IRON HYDROXIDE PIGMENTS, BY COUNTRY OR LOCALITY<sup>1</sup>

Country or locality	Natural				Synthetic			
	2018		2019		2018		2019	
	Quantity (metric tons)	Value <sup>2</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)	Quantity (metric tons)	Value <sup>2</sup> (thousands)
Austria	529	\$733	490	\$820	--	--	46	\$44
Belgium	(3)	2	--	--	8	\$56	31	144
Brazil	--	--	--	--	9,970 <sup>r</sup>	12,400	13,900	16,400
Canada	--	--	(3)	2	6,230	5,870	7,760	4,360
China	28	53	2	4	86,800	89,500	61,300	63,700
Colombia	--	--	--	--	1,430	2,050	1,210	1,840
Cyprus	2,120	1,030	1,370	721	--	--	--	--
France	492	402	913	785	230	1,870	173	1,580
Germany	--	--	--	--	52,600	64,700	58,500	67,600
Hong Kong	--	--	--	--	287	522	163	279
India	--	--	19	20	2,480	1,850	2,800	2,410
Italy	1	14	2	14	8,480	17,300	7,900	16,900
Japan	--	--	--	--	1,260	4,730	1,070	4,680
Korea, Republic of	--	--	--	--	12	132	12	103
Netherlands	4	3	--	--	58	53	77	59
Poland	--	--	--	--	(3)	3	47	42
South Africa	--	--	--	--	2	50	21	42
Spain	4,840	1,180	76	46	718	463	660	406
Taiwan	--	--	7	76	35	89	24	67
United Kingdom	4	3	--	--	90	595	108	699
Other	145 <sup>r</sup>	79 <sup>r</sup>	10	164	41 <sup>r</sup>	51 <sup>r</sup>	274	700
Total	8,170	3,500	2,880	2,650	171,000	202,000	156,000	182,000

<sup>r</sup>Revised. -- Zero.

<sup>1</sup>Table includes data through June 1, 2020. Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Customs value.

<sup>3</sup>Less than ½ unit.

Source: U.S. Census Bureau.



TABLE 6  
NATURAL IRON OXIDE PIGMENTS: WORLD PRODUCTION, BY COUNTRY OR LOCALITY<sup>1</sup>

(Metric tons)

Country or locality <sup>2</sup>	2015	2016	2017	2018	2019
Cyprus	3,503	3,816	3,335	5,189 <sup>r</sup>	3,013
France	8,010	7,876	8,287	8,222 <sup>r</sup>	8,000 <sup>e</sup>
Germany <sup>3</sup>	346,496	362,915	372,771	355,791 <sup>r</sup>	360,000 <sup>e</sup>
India <sup>4</sup>	2,203,708	2,684,563 <sup>r</sup>	1,847,995 <sup>r</sup>	2,365,850 <sup>r</sup>	2,500,000 <sup>e</sup>
Italy	37,962	36,837	34,902	8,819 <sup>r</sup>	9,000 <sup>e</sup>
Pakistan	51,534	90,424	71,779	90,619 <sup>r</sup>	70,000 <sup>e</sup>
Spain	10,966 <sup>r</sup>	11,386 <sup>r</sup>	8,966 <sup>r</sup>	10,000 <sup>r, e</sup>	10,000 <sup>e</sup>
United States	W	W	W	W	W
Total	2,660,000 <sup>r</sup>	3,200,000 <sup>r</sup>	2,350,000 <sup>r</sup>	2,840,000 <sup>r</sup>	2,960,000 <sup>e</sup>

<sup>e</sup>Estimated. <sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Table includes data available through September 24, 2020. All data are reported unless otherwise noted. Totals and estimated data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>In addition to the countries and (or) localities listed, Austria, Azerbaijan, Brazil, China, Honduras, Iran, Kazakhstan, Lithuania, Paraguay, Russia, South Africa, Turkey, Ukraine, and the United Kingdom may have produced iron oxide pigments, but available information was inadequate to make reliable estimates of output.

<sup>3</sup>Production includes natural and synthetic iron oxide pigments.

<sup>4</sup>Production is based on fiscal year, with a starting date of March 31 of the year shown.