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2016 Minerals Yearbook

IRON OXIDE PIGMENTS [ADVANCE RELEASE]

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Iron Oxide Pigments

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In 2016, natural crude iron oxide pigment (IOP) production in the United States increased significantly compared with that of 2015, but actual U.S. production data are withheld to avoid disclosing company proprietary data. Finished natural and synthetic IOPs sold by processors decreased slightly to 52,500 metric tons (t) valued at $82.3 million in 2016 from 53,500 t valued at $77.9 million in 2015 (table 1). Exports of pigment-grade iron oxides increased by 77% to 15,800 t valued at $45.6 million in 2016 compared with 8,930 t valued at $17.2 million in 2015. Imports of natural and synthetic IOPs combined increased slightly to 179,000 t valued at $197 million in 2016 compared with 176,000 t valued at $209 million in 2015 (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, they are derived from hematite (Fe_2O_3), which is a red iron oxide mineral; goethite or limonite (Fe-OH), minerals that vary from yellow to brown, which include ochers and siennas (yellow) and umbers (brown); and magnetite (Fe_3O_4), a black iron oxide mineral. A wider variety of colors can be produced from natural IOPs by blending various IOPs or by calcination of hydrated natural IOPs.

Synthetic IOPs are widely used as colorants and compete with natural IOPs in many color applications, in part because colors can be more precisely duplicated and a substantially wider variety of colors can be produced. They 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 three domestic producers. U.S. production data for crude (natural) IOPs sold or used in 2016 were developed using reported data from two of the three companies. Production for the third was estimated in part based on worker-hour reports from the U.S. Department of Labor's Mine Safety and Health Administration (MSHA). These data are withheld from publication to avoid disclosing company proprietary data. In 2016, following several years of producing mostly from its stockpiles, the leading producer resumed the mining of natural crude IOPs. Estimated production increased significantly in 2016 compared with that of 2015.

In a second voluntary USGS survey, sales data for finished (natural and synthetic) IOPs were received from 8 of 10 known processing operations, representing more than 80% of the tonnage shown in table 1. Data for the nonrespondents were estimated on the basis of prior-year sales levels and industry trends. Sales of finished pigments were 52,500 t in 2016, down slightly from 53,500 t in 2015. Sales data for finished IOPs were collected only from operations that process material, such as the crushing and grinding of natural IOPs, or that make synthetic IOPs, not operations that simply blend, mix, repackage, and (or) resell IOP material.

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. Regenerated iron oxide data were not included in table 1 because the iron oxides are not natural (mined) or synthetic (manufactured) and must undergo additional processing before being suitable for use in typical IOP applications.

Applied Minerals, Inc.'s Dragon Mine property in Utah contains high-purity iron oxide consisting of hematite, goethite, and limonite along with halloysite clay; the total measured iron oxide resource was 3.3 million metric tons (Applied Minerals, Inc., 2015a, b). Applied Minerals held separate contracts with two specialty chemical materials distributers to sell its AMIRON™ technical-grade iron oxide products and its DRAGONITE™ halloysite clay—with Brandt Technologies, LLC to sell Applied Minerals' products to States in the Midwest region of the United States and with E.T. Horn Co. to sell the same in Arkansas, Louisiana, Oklahoma, Texas, and the Western United States (Applied Minerals, Inc., 2015c, 2016, p. 22, 24, 26–27; BusinessWire, 2015). The company promoted its transparent IOP products to the woodstains market, as additives to foundry sands, and as a desulfurization catalyst to the energy and biogas industries as a cost-effective scavenger of highly corrosive hydrogen sulfide gas, a byproduct of the anaerobic conversion of biomass (Applied Minerals, Inc., 2015d; 2016, p. 22, 30). Applied Minerals was pursuing opportunities with domestic companies that had traditionally been dependent on imported IOP products from Asia as well as IOP customers in Asia and Europe (Applied Minerals, Inc., 2015a, b; Patel, 2015).

Texas-based Huntsman Corp., a global specialty chemical company, began production in May at its new $172 million synthetic IOP production plant near Augusta, GA. The plant was previously owned by Rockwood Pigments NA, Inc. Production includes black, red, and yellow synthetic IOPs at the 30,000-metric-ton-per-year (t/yr) advanced technology facility, the first new synthetic IOP plant built in the United States in nearly 35 years. The previously anticipated completion of the plant in 2015 had been delayed by adverse weather conditions, a change in engineering firms, and the transition in ownership

from Rockwood Pigments. Huntsman Corp. expected to begin to close its existing plants in East St. Louis, IL, Easton, PA, and part of its Beltsville, MD, facility and produce IOPs primarily at the new facility in Georgia (Rausch, 2015; Cline, 2016).

Consumption

End-use data for crude IOPs are not surveyed by the USGS or other organizations but are surveyed in the canvass of finished IOPs. The increased production of crude and synthetic IOPs combined and increases in domestic housing starts and completions of 6% and 9%, respectively, may suggest a similarly significant increase in IOP consumption (U.S. Census Bureau, 2017). In 2016, of the 52,500 t of finished natural and synthetic IOPs that were sold or used by processors, an estimated 54% of sales was for use in concrete and other construction products; 20% in paints and coatings; 9% for foundry sands and other foundry uses; 4% in industrial chemicals; 3% in animal foods; 2% in glass and ceramics; 1% in fertilizer; 1% in plastics, rubber, and cosmetics combined; and the remainder in other uses.

IOPs were used in 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 is often stamped to resemble brick, slate, stone, and many more shapes and forms found in nature, including wood (Pinto, 2008, p. 4, 6).

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

A major end use for regenerator 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 radio frequency coils, microwave communication systems, microwave ferrites for telecommunications, and other industrial applications. Other end uses for regenerator iron oxides include 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 238.9 in 2016 compared with 238.3 in 2015. The PPI measured the average change in the selling prices charged by domestic producers of IOPs over time (U.S. Bureau of Labor Statistics, 2017). The PPI was 238.8 in January, 237.2 in March through June, and 241.2 in July through December. Unit values for finished natural and synthetic IOPs reported by domestic producers ranged from $0.38 to $3.95 per kilogram, with an average unit value of $1.57 per kilogram.

Foreign Trade

In 2016, U.S. exports of pigment-grade and other iron oxides and hydroxides combined decreased by about 5%. IOPs were exported to China, 38%; Spain, 25%; Mexico, 11%; Belgium 9%; Canada, 6%; and Israel, 3% (table 3).

U.S. exports of pigment-grade iron oxides increased by 77% to 15,800 t valued at $45.6 million in 2016, and the unit value increased by 50% (tables 1, 3). Belgium was the leading destination, accounting for 37% of United States exports, followed by Mexico, at 27%; China, 17%; the United Kingdom, 4%; and Brazil and Taiwan, about 3% each (table 3). Exports of other grades of iron oxides and hydroxides decreased by nearly 18% to 47,800 t in 2016 with a total value of $26.1 million; the average unit value decreased by 3%. China, Spain, Canada, Mexico, and Israel were, in descending order, the major destinations for export of other grades of IOPs and hydroxides, accounting for about 44%, 33%, 8%, 6%, and 4% of the export tonnage, respectively (table 3).

U.S. imports of all IOPs and hydroxides increased slightly to 179,000 t in 2016 from those of 2015 and were about 69% higher than the recent low of 106,000 t in 2009 (tables 1, 4). Imports of natural IOPs nearly doubled to 7,110 t. The leading source of natural IOP imports was Spain, with 58% of the tonnage, followed by Cyprus with 28%; Austria, 7%; and France, 5%. Imports of synthetic IOPs were virtually unchanged. The leading sources of synthetic IOP imports were China with 50% of the tonnage; Germany, 29%; Brazil, 7%; and Canada and Italy, 4% each (table 5).

World Review

Natural IOPs were produced in at least nine countries in 2016 (table 6). Several other countries were thought to produce IOPs, but output, which may have been substantial, was not reported, and no basis was available for estimating output levels. Because many of Europe's IOP producers supplied external markets, they were not expected to be affected significantly by sluggish construction markets in Europe. In general, IOP companies with a global customer base were less vulnerable to regional economic fluctuations. Consumption of pigment minerals was expanding significantly for certain emerging markets, especially those in China, India, and Thailand.

Austria.—In 2016, Kärntner Montanindustrie GmbH continued production of micaceous iron oxide (MIO) from its underground mine in Waldenstein, from which it exported about 95% of its MIO products to the global market. It exported its products to as many as 80 countries (Kärntner Montanindustrie GmbH, 2016, p. 12). The U.S. Census Bureau reported United States imports of 532 t of MIOs from Austria in 2016, an increase from 470 t in 2015 (table 5). MIOs have 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 as paints or coatings on bridges, oil rigs, and other structural steel and as protective coatings on electrical and industrial equipment. Micronized grades are used in anticorrosive decorative coatings, including water-based coatings;

prime coatings, as partial replacement of zinc dust; and certain applications requiring a degree of friction (O'Driscoll, 2012).

China.—After 6 years of increasing imports of IOPs from the United States, averaging more than 31,000 t/yr and reaching a high of nearly 40,000 t in 2015, imports decreased to 21,200 t in 2016, suggesting increased production of IOPs in China to supply the demand for IOPs driven by the country's increasing construction activity (table 3).

Hong Kong-based Cathay Industries Group, in a joint venture with the Tonghua Group, produced synthetic IOPs (black, red, and yellow) at its new 65,000-t/yr synthetic IOP plant in Tongling, Anhui Province, eastern China. The plant included spray driers capable of producing 20,000 t/yr of pigment granules (Lismore-Scott, 2014; Patel, 2015, 2016). Phase two of a multiphased expansion for increasing the capacity by another 20,000 t/yr of the joint-venture plant, known as Rely Science & Technology Co., Ltd., began; completion of all the planned phases was expected to increase capacity to 150,000 t/yr thereafter. Phase two, the commissioning of which was expected to take place during the first quarter of 2018, was to include 10,000 t/yr of yellow IOP and 5,000 t/yr of red IOP capacity for coatings and paint products and 5,000 t/yr of high-purity black, red, and yellow IOP for use in food, personal care, and pharmaceutical products (Cathay Industries Australasia Pty Ltd., 2016). Products would be targeted for markets in China, where demand had been increasing at a rate of 7% to 8% per year in most IOP-consuming industries. The new plant was designed to use a new process, designed to enhance water and waste gas treatment and significantly reduce liquid and solid waste. This plant was Cathay Industries' eighth IOP plant in China, along with those in Shenzhen, Guangdong Province; Shanghai, Shanghai Province; and Wuxi, Anhui Province (Cathay Industries Europe N.V., 2013; Ollett, 2013a; Lismore-Scott, 2014).

In the first quarter of 2016, Lanxess AG began production at its 25,000-t/yr red synthetic IOP plant and later in the year at its 70,000-t/yr inorganic pigment mixing and milling plant at the Ningbo Chemical Park in Ningbo, Zhejiang Province. Highly saturated red IOPs and yellowish-red IOPs referred to by the company as the "New Reds" were produced using a newly patented "Ningbo Process," developed specifically for this plant, that places particular emphasis on water treatment; waste gas cleaning, including a reduction of nitrous oxides generated; and lower energy consumption (Lanxess AG, 2017, p. 44–45, 115). Lanxess also operated a 38,000-t/yr IOP plant in Jinshan, Shanghai Province, where it produced black and yellow IOPs (Ollett, 2013b, c; Sun, 2015).

Spain.—Promindsa SA, the country's leading producer of IOPs, produced and sold 14,500 t of IOPs in 2016, down slightly from nearly 15,000 t of IOPs in 2015; 85% of production was exported to 79 countries worldwide. The company expected to maintain mine production and sales at the same level in 2017. About 80% of Promindsa's IOP output and sales was red hematite, mostly from its 100-year-old Santa Rosa Mine. Promindsa sold its Santa Rosa iron oxide as a red pigment for use in asphalt, brick, glass and ceramics, paints, and roof tile. The company also operated other deposits in the Provinces of Cordoba, Granada, Soria, Teruel, and Zaragoza, from which it mined black (magnetite), brown (oolitic iron ore), and yellow (goethite) IOPs (Promindsa SA, 2013, 2016). Promindsa also operated the Ojos Negros Mine, a goethite iron ore project from which the company produced 1,500 t of brown IOP in 2016 (Fernando Prada, President, Promindsa SA, written commun., July 21, 2017).

Additionally, in 2016, Promindsa produced two new ranges of products at two new business units formed in 2015. One was a line of special color dispersion products for use in agriculture, cork, paints, plastics, and rubber, and the other included Micronox BIOX™ and Micronox ON16™ for the treatment and decontamination of contaminated soils or materials. Promindsa expected to increase its total IOP production by about 2,000 t in 2017 and an additional 3,000 t in 2018 owing to its new range of products. The new products are functional products for several applications that include use in construction and a variety of ceramic and environmentally sensitive treatments (Fernando Prada, President, Promindsa SA, written commun., July 21, 2017; Promindsa SA, 2017).

Outlook

With the overall global economy continuing to gradually increase, construction activity and consequent consumption of IOPs for coloring concrete and paints and coatings is expected to follow. On a global scale, growth in the IOP market is expected to continue to increase during the next several years to a market worth of $2.3 billion, mostly because of increased construction activity, especially in China, India, Indonesia, Southeast Asia, and the United States. Growth was projected to remain modest in the advanced economies, with stronger growth predicted in the emerging markets and developing economies. In terms of value, output from construction, the major end use in the global IOP market, reached about $8.8 trillion in 2016 and was forecast to increase by 15% to $10.1 trillion in 2021. The value of construction activity in the emerging economies is expected to continue to outpace that of the advanced economies with the Asia-Pacific region, which includes the large markets of China, Japan, and India, accounting for the largest share of the global construction industry. Continued growth is expected in the construction industry in the United States through 2021, in large part owing to growth in the residential sector (Timetric, 2017). Capital spending on construction projects that use IOPs is expected to gradually increase in Europe, owing to slow growth overall continuing in the region's construction industry, but varying by region and country (Patel, 2015; MarketWatch, Inc., 2016).

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TABLE 1
SALIENT U.S. IRON OXIDE PIGMENTS STATISTICS[1]

(Metric tons and thousand dollars)

	2012	2013	2014	2015	2016
Crude pigments sold or used:[2]					
Quantity	W	W	W	W	W
Value	W	W	W	W	W
Finished pigments sold:[3]					
Quantity	48,400	47,200	45,300	53,500	52,500
Value	77,700	75,400	71,500	77,900	82,300
Exports:[4]					
Quantity	8,950	8,170	8,790	8,930	15,800
Value	13,500	13,400	16,000	17,200	45,600
Imports for consumption:[3]					
Quantity	151,000	165,000	175,000	176,000	179,000
Value	182,000	190,000	208,000	209,000	197,000
World, production	1,900,000	1,750,000	2,720,000	2,480,000	2,460,000

W Withheld to avoid disclosing company proprietary data.
[1]Table includes data available through April 30, 2018. Data are rounded to no more than three significant digits.
[2]Mined.
[3]Natural (mined) and synthetic.
[4]Pigment grade.

TABLE 2
PRODUCERS OF IRON OXIDE PIGMENTS AND REGENERATED IRON OXIDES
IN THE UNITED STATES IN 2016[1]

Producers	Plant location
Pigments:	
Crude:	
Alabama Pigments Co., LLC	Green Pond, AL.
Applied Minerals, Inc.	Eureka, UT.
New Riverside Ochre Co., Inc.	Cartersville, GA.
Finished:	
Alabama Pigments Co., LLC	Green Pond, AL.
Applied Minerals, Inc.	Eureka, UT.
Dynamic Color Solutions, Inc.	Milwaukee, WI.
New Riverside Ochre Co., Inc.	Cartersville, GA.
Prince Minerals, Inc.	Quincy, IL; and Bowmanstown, PA.
Huntsman Corp. (formerly Rockwood Pigments NA, Inc.)	Beltsville, MD; Augusta, GA; Easton, PA; and East St. Louis, IL.
Regenerator iron oxides:	
American Iron Oxide Co.[2]	Allenport, PA; 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.

[1]Table includes data available through April 30, 2018.
[2]Division of International Steel Services, Inc.

TABLE 3
U.S. EXPORTS OF IRON OXIDES AND HYDROXIDES, BY COUNTRY OR LOCALITY[1]

	Pigment grade				Other grade			
	2015		2016		2015		2016	
Country or locality	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Argentina	1	$6	6	$22	3	$78	1	$9
Australia	66	176	80	233	1,530	849	629	530
Austria	1	3	4	9	--	--	--	--
Belgium	902	4,560	5,820	28,100	100	635	96	476
Brazil	308	1,190	545	1,650	213 r	221 r	207	239
Canada	12	16	9	14	4,450	8,690 r	3,900	8,480
Chile	119	78	245	252	88	63	20	255
China	1,970	4,080	2,710	3,870	37,600 r	11,100	21,200	6,420
Colombia	51	241	57	245	28	172 r	4	91
Czechia	--	--	--	--	8	117	12	184
Dominican Republic	19	69	6	24	2	7	2	8
Ecuador	--	--	--	--	18	61	1	29
France	38	207	68	325	1	12	4	18
Germany	51	501	88	764	291	794	16	79
Guatemala	12	24	14	24	--	--	--	--
Guyana	12	101	8	54	--	--	--	--
Haiti	4	14	3	11	6	26	4	15
Hong Kong	4	28	50	196	9	18	1	29
India	41	156	171	602	124 r	531 r	159	687
Indonesia	2	9	18	44	(2)	4	8	85
Israel	--	--	2	35	844	316	1,840	578
Italy	12	44	23	58	91	77	78	38
Jamaica	1	4	--	--	7	14	4	19
Japan	12	80	7	50	26	23	13	16
Korea, Republic of	114	422	118	722	15	309	18	255
Malaysia	--	--	19	10	17	45	5	51
Mexico	4,360	2,740	4,250	2,860	3,190	2,260	2,680	1,980
Netherlands	5	15	--	--	16	8	475	252
New Zealand	10	46	10	47	17	33	1	11
Norway	11	26	(2)	4	--	--	--	--
Peru	2	21	3	14	15	29	17	29
Singapore	12	60	2	15	48	83 r	52	143
Slovenia	--	--	--	--	1	16	1	10
South Africa	4	23	6	35	8	16 r	2	4
Spain	31	130	54	188	8,120	1,540	16,000	3,280
Taiwan	131	390	471	1,500	75	654	57	524
Thailand	99 r	122 r	42	139	394	1,520	95	583
Trinidad and Tobago	7	17	6	31	30	33	33	28
United Arab Emirates	160	81	--	--	120	77	1	26
United Kingdom	328	1,460	610	2,630	344	1,290	127	555
Uruguay	--	--	238	653	219	806	--	--
Venezuela	1	15	6	16	58	58	--	--
Vietnam	--	--	2	6	2	11	--	--
Other	9 r	16 r	52	112	11 r	81 r	47	86
Total	8,930	17,200	15,800	45,600	58,100 r	32,700	47,800	26,100

rRevised. -- Zero.
[1]Table includes data available through April 30, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]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[1]

Type	2015 Quantity (metric tons)	2015 Value[2] (thousands)	2016 Quantity (metric tons)	2016 Value[2] (thousands)	Principal sources, 2016 (metric tons)
Natural:					
Earth colors[3]	2,440	$1,490	6,120	$2,070	Spain, 4,160; Cyprus, 1,960.
Micaceous	1,160	1,170	989	1,410	Austria, 532; France, 376; Spain, 57.
Total	3,600	2,660	7,110	3,480	
Synthetic:					
Black	49,300	55,000	48,100	46,800	China, 17,700; Germany, 16,800; Canada, 7,260; Italy, 6,110.
Red	67,100	78,700	70,100	80,000	China, 44,300; Germany, 20,000.
Yellow	55,100	71,400	52,400	64,400	China, 23,700; Germany, 12,400; Brazil, 12,300.
Other[4]	716	1,370	1,430	2,070	China, 1,040; Canada, 123; Japan, 108.
Total	172,000	206,000	172,000	193,000	
Grand total	176,000	209,000	179,000	197,000	

[1]Table includes data available through April 30, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Customs value.
[3]Includes those not elsewhere specified or included.
[4]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[1]

	Natural				Synthetic			
	2015		2016		2015		2016	
Country or locality	Quantity (metric tons)	Value[2] (thousands)	Quantity (metric tons)	Value[2] (thousands)	Quantity (metric tons)	Value[2] (thousands)	Quantity (metric tons)	Value[2] (thousands)
Australia	--	--	--	--	--	--	18	$14
Austria	470	$625	532	$1,020	34	$180	7	38
Belgium	--	--	--	--	195	383	39	29
Brazil	--	--	--	--	12,200	16,900	12,300	16,300
Canada	--	--	--	--	10,300	4,220	8,170	4,290
China	6	13	21	22	89,600	96,500	86,700	86,500
Colombia	--	--	--	--	2,340	3,500	2,200	2,680
Cyprus	2,210	1,120	1,960	1,090	--	--	--	--
France	593	491	376	341	195	1,660	256	1,970
Germany	--	--	--	--	46,800	57,900	49,100	59,200
Hong Kong	--	--	--	--	500	437	552	718
India	--	--	--	--	245	146	2,860	1,500
Italy	4	13	3	11	8,250	19,400	7,780	14,400
Japan	--	--	--	--	673 r	4,410 r	1,420	4,890
Korea, Republic of	--	--	--	--	5	11	1	46
Netherlands	15	13	4	32	77	119	50	85
Norway	--	--	--	--	314	274	37	29
Spain	297	387	4,210	945	331	192	530	294
Switzerland	--	--	--	--	73	78	--	--
Taiwan	--	--	--	--	22	57	48	87
United Kingdom	--	--	--	--	3	57	8	78
Other	--	--	(3)	22	(3) r	9 r	1	31
Total	3,600	2,660	7,110	3,480	172,000	206,000	172,000	193,000

rRevised. -- Zero.
[1]Table includes data available through April 30, 2018. Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Customs value.
[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 6
NATURAL IRON OXIDE PIGMENTS: WORLD PRODUCTION, BY COUNTRY OR LOCALITY[1]

(Metric tons)

Country or locality[2]	2012	2013	2014	2015	2016
Austria, micaceous iron oxide	3,500 r	3,500 r	3,500	3,500	3,500 e
Cyprus, umber	3,394	4,016	3,793	3,503	3,500
France[e]	900	900	900	1,000 r	1,000
Germany	204,198	205,000	200,000	200,000	200,000 e
India, ocher[3]	1,628,522 r	1,490,033 r	2,467,767 r	2,203,708	2,200,000
Italy[e]	118	137	130 r	150	150
Pakistan, ocher[4]	42,107	31,873 r	27,507	51,534	40,000
Spain, ocher and red iron oxide	16,500	16,400	16,000	16,000	16,000
United States	W	W	W	W	W
Total	1,900,000	1,750,000	2,720,000	2,480,000	2,460,000

[e]Estimated. [r]Revised. W Withheld to avoid disclosing company proprietary data.
[1]Table includes data available through November 23, 2017. All data are reported unless otherwise noted. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.
[2]In addition to the countries and (or) localities listed, a number of others likely continue to produce iron oxide pigments, but output was not reported and no basis was available to make estimates of output levels; such countries include Azerbaijan, Brazil, China, Honduras, Iran, Kazakhstan, Lithuania, Paraguay, Russia, South Africa, Turkey, Ukraine, and the United Kingdom. Unreported output was probably substantial.
[3]Production is based on fiscal year, with a starting date of March 31 of the year stated.
[4]Production is based on fiscal year, with a starting date of June 30 of the year stated.