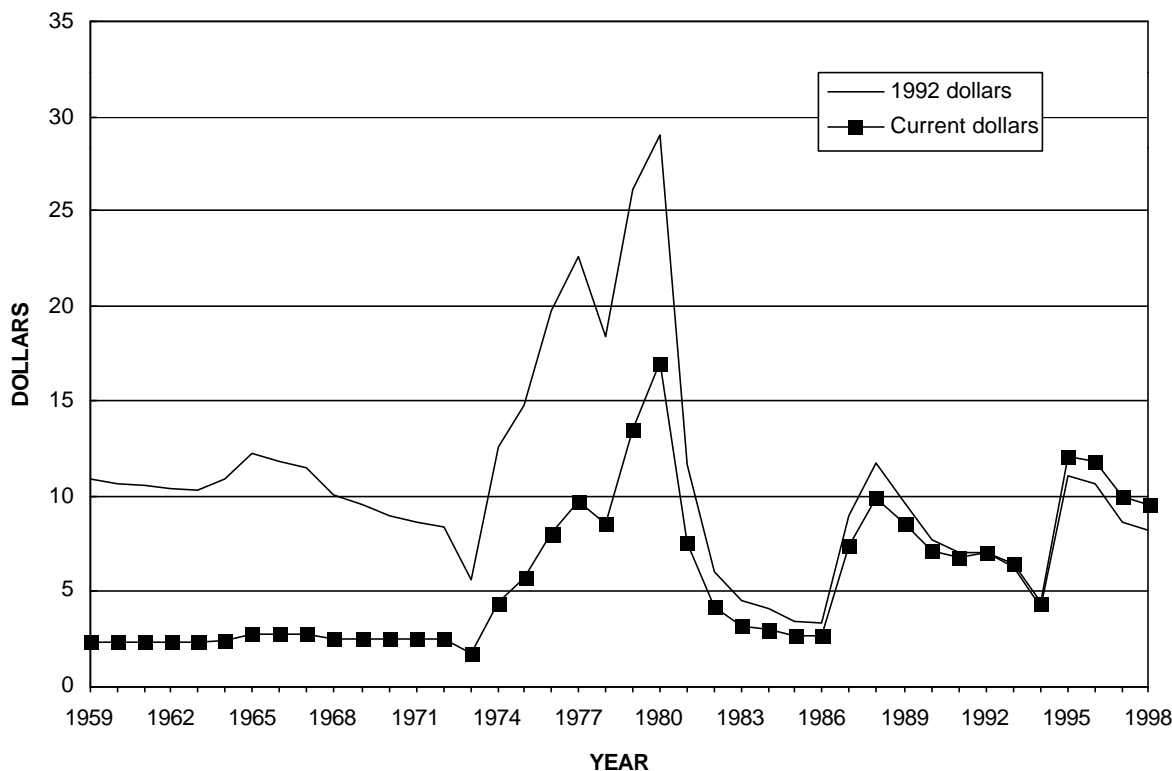


Annual Average Indium Price (Dollars per troy ounce)



Significant events affecting indium prices since 1958

1973-80	Period of high demand, significant increase for nuclear control rods
1979	Lower demand after nuclear powerplant accident at Three Mile Island
1980-82	Economic recessions
1985	Development of indium phosphide semiconductors and indium-tin-oxide thin films
1989	Indium added to National Defense Stockpile (NDS) acquisition plan
1992-94	NDS acquisition of indium
1995	Steady price increase owing to tight supply and strong demand
1996	Steady price decline owing to greater supply and significant recycling
1997	Release of more than half of NDS holdings
1997-98	Reduced demand owing to decrease in production of liquid crystal displays (LCD's) and to shift to more-efficient thin-film technology

Indium is produced mainly from residues generated during zinc ore processing. Prior to 1940, indium was used almost entirely for experimental purposes, although domestic production had begun in 1926. Because of its rarity, about the same as that of silver (Weeks, 1973, p. 242) and lack of industrial

applications, indium was sold only in small quantities during this period. The first commercial application came in 1933, when small amounts of indium were added to certain gold dental alloys. The Indium Corporation of America (ICA) was founded in 1934 and became the major domestic producer.

From 1940 through 1945, prices were usually determined through individual negotiations between the producer and consumer (Ludwick, 1959, p. 9).

The first large-scale application for indium was as a coating for bearings in high-performance aircraft engines during World War II (Slattery, 1995, p. 157). Indium increased hardness and helped prevent seizure and corrosion of the bearings. After the war, production gradually increased as new uses were found in fusible alloys, solders, and electronics. A producer price for indium was first established by the ICA in 1945, and it remained at the same level through 1963.

During the period from 1973 through 1980, demand increased, especially for use in nuclear control rods, and easily accessible supplies of raw materials gradually decreased. The ICA depleted its source of feedstock in Bolivia and then obtained source material from Europe. The inability to meet demand was the major factor in the price reaching \$20 per troy ounce during 1980, when the annual average price was \$17. To increase supply, world producers expanded production capacities.

Orders for nuclear control rods dropped when the rate of nuclear power expansion decreased in the United States following the Three Mile Island accident in 1979. Increased production led to an oversupply during the recessions of the early 1980's. By 1982, the price had plummeted to less than \$3 per troy ounce (annual average was \$3.19). In 1988, in response to growing demand, especially in the Japanese electronics industry, it climbed to nearly \$10 per troy ounce.

In the middle and late 1980's, the development of indium phosphide semiconductors and indium-tin-oxide thin films for LCD's aroused much interest. By 1992, the thin-film application had become the largest end use (Jasinski, 1993).

In 1989, indium was included in the list of materials to be added to the NDS (Schmitt, 1989). The original stockpile goal was 42 metric tons; this was reduced to 7.7 tons in 1992. During that same year, the Defense Logistics Agency, manager of the NDS, began purchasing indium. The NDS had acquired its highest level, 1.56 tons of indium, by 1994. According to the NDS Annual Materials Plan for 1996, indium was to be eliminated from the stockpile, but sales would be limited to 1.1 metric tons per year (American Metal

Market, 1997). Slightly more than this amount was sold in 1997, leaving the inventory at 0.44 ton, which was sold in December 1998.

In 1995, a tight supply situation with strong demand forced the price to increase steadily to a \$16.25 per troy ounce high. The following year, increased supply and the implementation of an efficient recycling process forced prices back down to a \$6.53 per troy ounce low (Roskill Information Services Ltd., 1996, p. 34). This dramatic rise-and-fall is hidden in the annual average statistics, which indicate a drop of only \$0.20 from 1995 to 1996.

In 1998, indium demand slackened owing to the second successive year of somewhat lower LCD production and the introduction of a new thin-film coating technology that requires only one-third as much indium per unit as the older process (Roskill Information Services Ltd., 1998, p. 2). After fluctuating moderately in 1997, the price was quite steady in 1998.

References Cited

- American Metal Market, 1997, DLA planning sale of indium: American Metal Market, v. 105, no. 35, February 20, p. 12.
- Jasinski, S.M., 1993, Indium, *in* Mineral Commodity Summaries 1993: U.S. Bureau of Mines, p. 84-85.
- Ludwick, M.T., 1959, Indium, discovery, occurrence, development, and characteristics: Utica, NY, Indium Corporation of America, 770 p.
- Roskill Information Services Ltd., 1996, The economics of indium: London, Roskill Information Services Ltd., 111 p.
- 1998, Indium—Prices may fall: Roskill's Letter from Japan, no. 270, October, p. 2.
- Schmitt, Bill, 1989, Pentagon report urges stockpiling of indium, rhodium, and ruthenium: American Metal Market, v. 97, no. 78, April 21, p. 1.
- Slattery, J.A., 1995, Indium and indium compounds, *in* Kirk-Othmer encyclopedia of chemical technology (4th ed.): New York, John Wiley, v. 14, p. 155-160.
- Weeks, R.A., 1973, Gallium, germanium, and indium, *in* Brobst, D.A., and Pratt, W.P., eds., United States mineral resources: U.S. Geological Survey Professional Paper 820, p. 237-246.

Annual Average Indium Price¹
(Dollars per troy ounce²)

Year	Price	Year	Price	Year	Price	Year	Price
1936	30.00	1952	2.25	1968	2.50	1984	3.00
1937	30.00	1953	2.25	1970	2.50	1985	2.63
1938	30.00	1954	2.25	1970	2.50	1986	2.61
1939	30.00	1955	2.25	1971	2.50	1987	7.30
1940	23.00	1956	2.25	1972	2.50	1988	9.92
1941	12.50	1957	2.25	1973	1.77	1989	8.55
1942	22.50	1958	2.25	1974	4.42	1990	7.15
1943	12.50	1959	2.25	1975	5.67	1991	6.78
1944	8.75	1960	2.25	1976	8.03	1992	7.01
1945	4.88	1961	2.25	1977	9.77	1993	6.43
1946	2.25	1962	2.25	1978	8.56	1994	4.44
1947	2.25	1963	2.25	1979	13.48	1995	12.06
1948	2.25	1964	2.40	1980	17.00	1996	11.86
1949	2.25	1965	2.75	1981	7.53	1997	9.93
1950	2.25	1966	2.75	1982	4.18	1998	9.52
1951	2.25	1967	2.75	1983	3.19		

¹99.97%-pure indium.

²To convert to dollars per kilogram, multiply by 32.1507.

Note:

1936-66, Indium Corporation of America, producer price.

1967-93, U.S. producer price, *in* Metals Week (through June 14, 1993).

1993-98, U.S. producer price, *in* Platt's Metals Week.