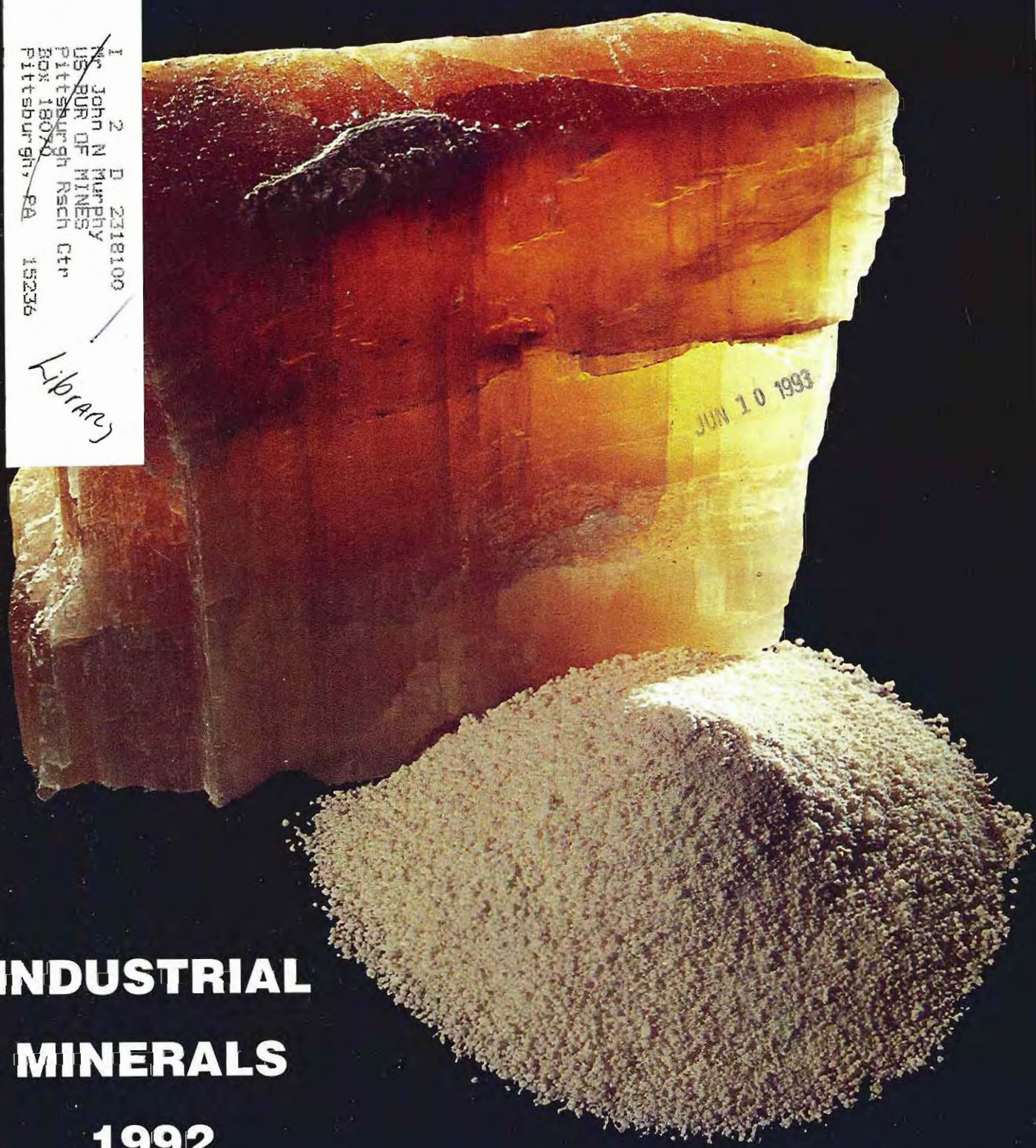
JUNE 1993

# MINING ENGINEERING

A PUBLICATION OF THE SOCIETY FOR MINING, METALLURGY, AND EXPLORATION, INC.





## INDUSTRIAL MINERALS 1992

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## DEPARTMENTS



### ANNUAL REVIEW

Each June, **MINING ENGINEERING** reviews what happened in the industrial minerals industry the previous year. This year, the industrial minerals profiles begin on page 563.

### THANK YOU

**ME** editors thank the authors and contributors who make possible this June annual review issue. We appreciate your help. **ME** readers should benefit from your efforts. Cover photo courtesy of Union Pacific Resources.

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## SPECIAL ISSUE: 1992 ANNUAL REVIEW



## TECHNICAL PAPERS (peer reviewed and approved)

tially silica free.

Waterjet cutting and cleaning technology continued to evolve and grow. Garnet is used in a focused, high-pressure water stream to cut metals, composites, fiberglass and fabrics. This technology can cut multiple thickness of materials to extremely close tolerances. It is being applied on a coarser level, used in construction, cleaning and demolition.

After the Persian Gulf War, garnet from the Barton Mines in New York was used to cut the damaged well heads from Kuwait's burned oil fields. Hydroblasting systems have used garnet to cut hard or metallic scale from pipes without damaging them.

Flow Industries, an equipment manufacturer, and Emerald Creek Mining of Idaho, are working jointly to expand the waterjet market.

Other traditional markets for garnet grains and polishing powders remained unchanged. These markets include the manufacture of bonded and coated abrasives, the polishing of television face plates and other glass items.

Market prices for garnet grains and powders depend largely on the degree of processing and on transportation costs. Prices range from lows of about $181/t ($165/st) to more than $2200/t ($2000/st) for high-quality powders.

US production of technical grade garnet was limited to Barton Mines' operation in Warren County, NY. Garnet from there is shipped worldwide for coated abrasives and powder applications.

Production of blasting, abrasive-grade almandite garnet and garnet for water filtration is centered at the Emerald Creek Mine in Benewak County, ID.

NYCO continued to produce andradite garnet as a byproduct of wollastonite mining in Essex County, NY. International Garnet Abrasive processed NYCO garnet at its New York operation and reclaimed and processed imported garnet at its Louisiana plant.

Barton Mines and others continued to import garnet for abrasive blasting. Nearly all of this material originated with Garnet Millers Associates (GMA), of Perth, Western Australia. The GMA group operates an alluvial mine north of Perth. It produces a low, free-silica blast medium for the world market and has been approved for use by the US Navy.

Garnet consumption is expected to grow during the 1990s at an average of more than the Gross Domestic Product. The principle cause of this upward trend is the growing environmental pressure on silica and slag media.

Similar pressure is being felt by eastern producers and users. Users have begun to recognize that the higher cost of almandite garnet blast media is often offset by reduced environmental compliance costs and future liability.

Sources of almandite garnet are being evaluated in Montana, Maine and Arizona, as well as in Italy, to meet that demand.

Andradite deposits in British Columbia, California and Nevada continue to be evaluated. Timing for these and other potential suppliers is not known. Additional supplies of quality material will remain available from foreign sources, particularly in India and Australia. ♦

## Gems

**G.T. Austin**, *US Bureau of Mines*

In 1992, the value of natural gemstones, fresh water pearls, salt water pearls, coral and synthetic and simulant gemstones from the United States was $69.4 million, according to preliminary estimates by the US Bureau of Mines.

The value of natural gem material produced was $51.2 million, a 53% decrease compared to 1991. The value of synthetic and simulant production was $18.2 million, a 5% decrease from the previous year.

US production accounted for about 2% of the $3.1 billion of estimated US consumption of gems and gemstones.

Total 1992 US imports of gem materials were $4.84 billion, according to the Bureau of the Census. Diamonds accounted for $4.14 billion, or about 86% of the total imports.

Even in light of the US recession, the flow of gems and gemstones increased into the United States. US exports and re-exports of gem materials amounted to $1.61 billion. Of that, the significant portion was diamonds. Imports in 1992 increased slightly compared to 1991, while exports plus re-exports decreased 5% for the same period.

Diamond sales by De Beers Centenary AG was $3.4 billion in 1992, a decrease of 13% compared to 1991 sales of $3.9 billion. Sales during the second half of 1992 were only $1.63 billion, 12% less than the $1.84 billion sales for the second half of 1991. A De Beers official said that the reduction in sales was the result of the economic conditions in the United States and Japan. De Beers controls about 80% of the rough, uncut diamonds sold in the world.

Preliminary estimates of 1992 official world gem diamond production were 10.4 t (52 million carats), according to the Bureau of Mines, an 8% increase from 1991. Official production is the production reported by the governments of the producing countries or the mining companies and does not include the production marketed through unofficial channels.

Production through unofficial channels historically has been estimated to be between 5% and 10% of official production, or an additional 520 kg to 1 t (2.6 to 5.2 million carats). During 1992, the percentage of unofficial goods may have been higher than the historical percentages because of problems in Angola and Zaire.

Australia maintained its position as the largest diamond producing country. Production from Argyle increased to a record high of 7.8 t (39 million carats). Production from Argyle is 55% industrial and 45% gem and near-gem. Diamond production in other producing countries fluctuated, increasing in some, decreasing in others and remaining essentially unchanged in a few.

Supplies of colored gemstones were strong because of increased production from a number of new deposits and from some old producing areas. Supplies of certain select gemstones were in tight supply. Therefore, prices increased — high quality rubies would be one example.

African production of amethyst, aquamarine, emerald, garnet, ruby, sapphire, topaz and tourmaline increased in quantity and quality. Gemstone production also increased in Afghanistan, Brazil, Madagascar, Pakistan and Sri Lanka.

There was a continued strong demand for synthetic and simulant gem stones. Both the quantity and value of imports and exports increased in 1992. Increased use of synthetics and simulants in solid 10 and 14 karat gold settings assure a growing market for these gems. The materials are being used to duplicate expensive originals as well as to

*create in*expensive originals. Complete lines of jewelry made with gold and synthetic or simulant gems are being manufactured for a wide range of consumer tastes. Cubic zirconia (CZ) is becoming a major force in the jewelry industry. It is estimated that US annual sales of CZ jewelry are now in the range of $400 million.

Also, 1992 was the first year that a significant amount of Russian synthetic gemstones made their way into the United States and world markets. ♦

# Graphite

**G.P. Hand**, *Superior Graphite Co.*

The usage of graphite in the United States in 1992 was fairly flat compared to 1991 levels. The recession left a sluggish economy, which did little to improve the domestic use of graphite.

The major industries using graphite continued to be batteries, carbon parts, coatings, crucibles, foundries, friction materials, graphite foil, iron, lubricants, pencils, powder metal, refractories, rubber and steel.

All natural graphite continued to be imported, with a noted increase in imports from Canada. The principle suppliers of natural graphite to the United States are Brazil, Canada, Madagascar, Mexico, Sri Lanka and Zimbabwe. The US government continued to liquidate small portions of the National Defense Stockpile of natural graphite, a program that began in 1991.

There are basically five types of graphite used in the United States. They are amorphous, crystalline flake, crystalline vein, synthetic and modified-purified graphites.

## Amorphous

The use of amorphous graphite in the United States was flat compared with 1991. The largest user of this type of graphite is the refractory industry, which was still dealing with the reduced demand from its biggest customers, the automotive, iron and steel industries.

The price of this material varied throughout the year, with very low prices being extended on screened, nonvalue-added grades to large users.

The supply of amorphous graphite was more than enough to meet demand, except for the beginning 1992. Mexico, the largest supplier of amorphous graphite to the United States, experienced interruptions in supply due to a severe rainy season. Because of this weather, Mexican producers had difficulty drying the graphite, as well as logistical problems transporting the graphite over washed out roads. The weather situation cleared in March 1992 but the effects of the supply interruption were felt well into the second quarter.

## Crystalline flake

The use of flake graphite in the United States was relatively stable. The major uses for this type of graphite continued to be refractories, graphite foil, crucibles, friction materials, pencils and powder metal.

Crystalline flake suppliers were Brazil, Canada, China, Madagascar, Mexico and Zimbabwe. Supply was more than sufficient to meet demand. In particular, the fine particulate material (-150 mm or -100 mesh) was a drudge on the market.

Canada continued to gain market share in 1992, primarily at the expense of China. China countered this market penetration by lowering prices between 10% and 20% at the Canton fair, which is held every Oct. 15 in Canton, China.

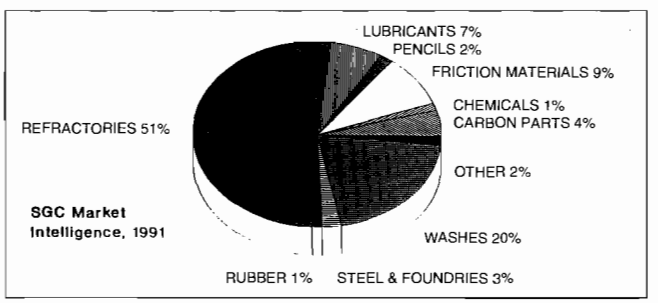
Although this stopped the shift in market share, it also dropped prices near to breakeven or below profitable levels for most flake graphite producers. this may be good news in the short-term for consumers of this graphite. It is, however, bad news for the newer mines, such as those in Canada. It also makes entering the market very tentative for prospective mines in places such as Namibia, Australia and Mozambique.

Also of interest in the flake area was the US Bureau of Mines' development of a flake graphite from Kish (a waste product of steel production). This is a new technology that appears to be limited by the availability of Kish.

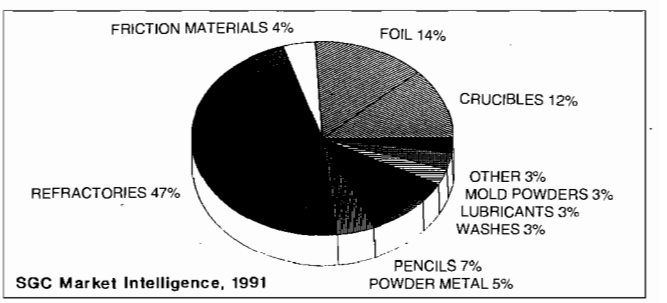
Russian graphite never surfaced on the domestic market. Considering the current and ongoing price battles, the appearance of supplies of this source of graphite seems remote.

## Crystalline vein

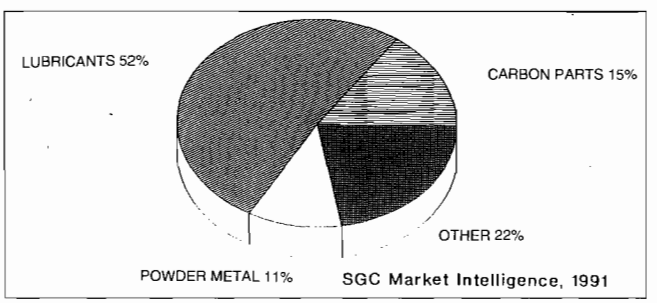
The demand for crystalline vein graphite in the United States also remained flat. Major applications continue to be lubricants, carbon parts and powder metal. This type of graphite has been replaced over the last decade with high-purity, natural, synthetic and modified-purified graphites.



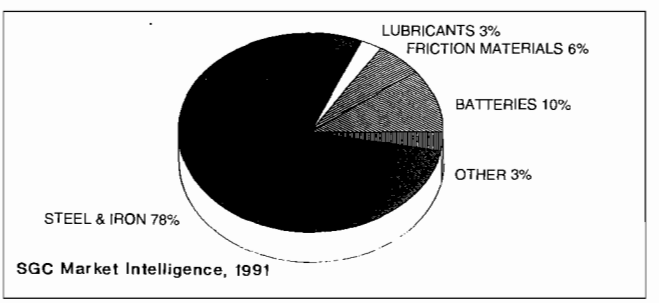

Amorphous graphite usage in North America.




Flake graphite usage in North America.




Crystalline vein usage in North America.




Synthetic graphite usage in North America.