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Chapter A of
Contributions to Industrial-Minerals Research

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Contributions to Industrial-Minerals Research, a biennial series of U.S. Geological Survey (USGS) Bulletin chapters, presents research strategies, results, and updates of investigations of industrial minerals by USGS scientists and cooperators. Industrial minerals are defined as valuable nonmetallic, nonfuel geologic materials, generally rocks or minerals, used in a wide range of construction and industrial applications—for example, sand, gravel, and crushed rock used as aggregate for construction; limestone used for cement; phosphate for fertilizers and insecticides; and diatomite used for filtration, fillers, and abrasives. The term also comprises some processed materials, such as cement and metallic compounds with major utilization in nonmetallic forms. For example, titanium is commonly grouped with industrial minerals because more than 90 percent of it is sold and utilized in the form of the oxide (TiO_2) rather than as Ti metal. Other metals and metallic compounds commonly grouped with industrial minerals include Mn, Cr, Fe oxides, and rare-earth elements (REEs).

The USGS has a long history of research on industrial minerals, particularly studies of deposit characteristics and depositional environments. Commodity-oriented studies of industrial minerals were a focus of major USGS research efforts by the start of the 20th century. During the first half of that century, large regional studies were undertaken on evaporite minerals, especially potash and clays, pegmatite minerals, and phosphate. Although the variety and amount of industrial-mineral uses in society had expanded by the second half of the century, the scope of industrial-minerals-research activities within the USGS had decreased relative to metals. The few resource appraisals during the 1970s and 1980s only erratically addressed industrial-mineral resources, owing to a lack of data, models, and expertise. Early modeling efforts in the mid-1980s produced deposit models for only a handful of industrial minerals.

Beginning in 1988, the USGS sponsored a series of workshops on industrial minerals. The first workshop, on the industrial minerals of Arizona, was held in cooperation with the Arizona Geological Survey (Tooker, 1989). A similar workshop on the industrial minerals of California was held in 1989, in cooperation with the California Division of Mines and Geology. In 1991, the USGS Mineral Resources Program considered the results of these workshops and performed a self-evaluation of its industrial-minerals research in an internal report entitled "Proposal to Prioritize Commodities." This report recommended that research priority be given to the following industrial minerals: aggregate, clay, limestone-dolomite, phosphate, potash, REEs, dimension stone, gypsum-anhydrite, wollastonite, and zeolites. In addition, the Mineral Resources Program cosponsored additional workshops on the industrial minerals of the Basin and Range Province of the Western United States (1990) in cooperation with the Nevada Bureau of Mines and Geology, the Utah Geological Survey, and the Idaho Geological Survey (Tooker, 1992), and on the industrial minerals of the Midcontinental United States (1995) in cooperation with the Arkansas Geological Commission, the Illinois Geological Survey, the Kansas Geological Survey, the Kentucky Geological Survey, the Missouri Division of Geology and Land Survey, the Nebraska Division of Conservation and Survey, and the Oklahoma Geological Survey.

Concurrently, in the early 1990s, additional industrial-mineral-deposit models were developed in support of quantitative mineral-resource assessment. These models included descriptive, grade-and-tonnage, and spatial models for approximately 50 industrial-mineral-deposit types and subtypes. In 1994, a USGS workshop held in Tucson recommended that the USGS develop a "toolkit" for assessing industrial minerals as a part of our regional assessments. In the mid-1990s, the minerals yearbook data collection and publication function of the U.S. Bureau of Mines (USBM) was transferred to the USGS' Mineral Resources Program as the Mineral Information Team with the closure of the USBM. This expertise was included in a second Mineral Resources Program workshop to address industrial-minerals-research priorities in July 1997. In this workshop, the importance of incorporating economics, user needs, and environmental considerations into our industrial-minerals research was emphasized, as were the needs to prioritize industrial-mineral commodities for study and to treat industrial-minerals research as equal partners with metals research for staffing and budgeting purposes.

Currently, the USGS supports three regional industrial-mineral projects: one each in the Eastern, Central, and Western United States. In addition, the Minerals Information Team continues to publish yearly statistics on a wide variety of industrial-mineral commodities. In 2001, an informal study was conducted of industrial-mineral occurrences, production, and markets in the United States to help Western Industrial Mineral Project staff prioritize their research strategies and commodities. Geographically limited, high-volume, high-value industrial minerals that fill a critical role in the regional

and U.S. economy were identified as a high priority. Some of the commodities that meet these criteria include the clay minerals attapulgite and sepiolite, borates, carbonate rocks, diatomite, feldspar, kaolin, phosphate, potash, REEs, silica (sand and quartz), soda ash, sulfur, and talc.

An additional issue driving USGS industrial-minerals-research priorities is the ongoing conflict between increasing demand for construction materials and the need for environmental protection in many rapidly expanding urban areas. This concern draws special attention to aggregate, which accounts for more than 30 percent of the total value of nonfuel mineral production in the United States. The use of megaquarries to mitigate such problems is an important focus of ongoing study. Diatomite and borate, which occur in ancient lacustrine and marine deposits already under study in the Western United States, have important regional, national, and export markets. Other industrial-mineral deposits in the Western United States, such as garnets, REEs, and, potentially, diamonds, also have important national and export markets. In addition, selected innovative resource-evaluation methods, especially the use of new genetic models, together with innovative spatial- and statistical-analysis techniques, are being considered for future research. The *Contributions to Industrial-Minerals Research* series serves as a venue for timely publication of ongoing and completed research on these and other industrial minerals.

References Cited

Tooker, E.W., compiler-ed., 1989, Arizona's industrial rock and mineral resources—workshop proceedings: U.S. Geological Survey Bulletin 1905, 93 p.

———1992, Industrial minerals in the Basin and Range region—workshop proceedings: U.S. Geological Survey Bulletin 2013, 132 p.