THE GEOLOGICAL SURVEY OF WYOMING
Gary B. Glass, State Geologist

OPEN FILE REPORT 90-1

ANORTHOSITE IN WYOMING

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Laramie, Wyoming
1990

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Introduction

Anorthosite is a plutonic igneous rock composed almost entirely of plagioclase, a type of feldspar, which is usually the variety labradorite (Thrush, 1968). Anorthosite became widely known in the late 1960s because it was the first rock type brought to Earth from the moon. Anorthosite bodies are relatively uncommon on Earth.

In the United States, anorthosite is found in the San Gabriel Mountains in southern California (Carter, 1982); the Wichita Mountains of southwestern Oklahoma (Grubbs and Moose, 1981); the Adirondack Mountains, New York; Boehls Butte, Idaho; northeast Minnesota; the Bitterroot Range, Montana; Big Burro Mountains, New Mexico; Honeybrook, Pennsylvania; Roseland, Virginia; Mellon and Tigerton, Wisconsin (Anderson, 1968); and the Laramie Mountains of southeastern Wyoming (**Figure 1**). Anorthosite bodies are common in southeastern Ontario and southwestern Quebec, Canada.

This report briefly describes the only anorthosite body in Wyoming, and discusses some potential industrial uses of the rock.

The Laramie Mountains Anorthosite

The Laramie Mountains Anorthosite is located in parts or all of Ts. 16 to 21N, Rs. 71 and 72W, with an eastern extension in the west 1/2 of both Ts. 18 and 19N, R.70W (**Figure 2**). Most of the anorthosite is in Albany County, but the eastern end extends into Platte County. It has been extensively studied. For detailed geological and geophysical information, see Fuhrman and others (1988), Rocky Mountain Energy (1985), Snyder (1984), Taylor (1978), Blackstone, (1976), Subbarayudu (1975), Hodge (1972), Smithson and Hodge (1972), and Nelson 1965.

There are two major outcrop areas in the Laramie Mountains (**Figure 1**). The larger, about 220 square miles, is the northern outcrop, north of the center of T.17N. The smaller outcrop, 40 square miles, is located south of and just within the southern edge of T.17N. The northern anorthosite contains both anorthosite and noritic anorthosite. Pods of magnetite-ilmenite are found within the

Figure 1. Index map showing anorthosite bodies in the United States.

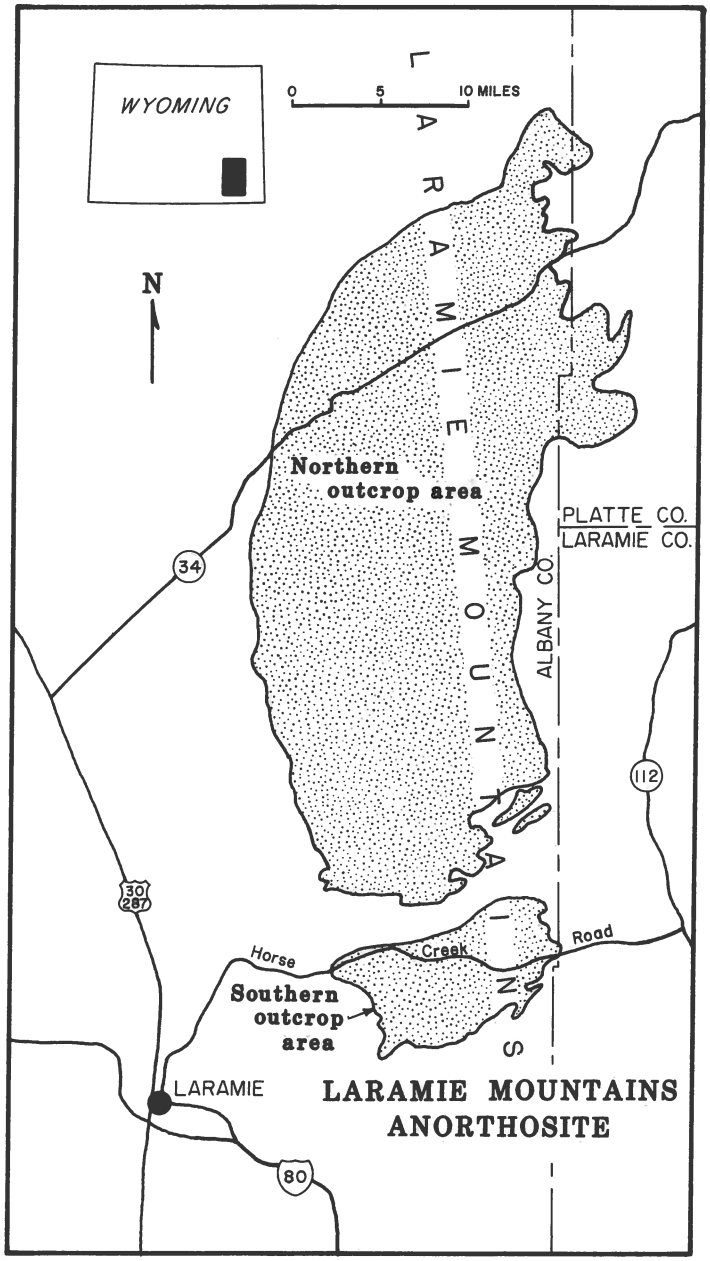

Figure 2. Index map of a part of southeastern Wyoming showing the location of the Laramie Mountains Anorthosite. (Geology from Love and Christiansen, 1985.)

northern anorthosite body. The anorthosite is light bluish gray to light gray. Mafic minerals, mainly orthopyroxene, locally compose only 1 to 2 percent of the rock (Rocky Mountain Energy, 1985).

The southern body of anorthosite, is primarily medium-grained to coarse-grained gray plagioclase. Locally, 25 percent of the rock may be mafic minerals (Rocky Mountain Energy, 1985).

Potential economic uses of anorthosite and associated magnetite from the Laramie Mountains

Anorthosite is both an industrial rock and a potential source of aluminum. The primary interest in anorthosite at the present time lies in its high-alumina (Al_2O_3) content, which makes it a potential source of aluminum. Several studies have been made of the Laramie Mountains anorthosite regarding its potential as a source of aluminum (Rocky Mountain Energy, 1985; Grubbs and Moose, 1981; Lundquist and Blue, 1970; Harrer, 1954; and Brown and others, 1947). Bauxite, a weathering product of aluminous rocks found in tropical regions of the globe, is currently the primary source of aluminum. World resources of bauxite are limited. When these are depleted, anorthosite will probably become the most economical source of aluminum. Therefore, the Laramie Mountains anorthosite could have great potential.

Industrial uses of the anorthosite and associated magnetite-ilmenite bodies include construction aggregate, decorative aggregate, decorative stone, feldspar, and magnetite sand. Locally, rock from the anorthosite bodies has been used as aggregate in highway base, subbase and surfacing. Coarse material from the southern body has been used as surfacing on the gravel Horse Creek Road, in Albany County.

The mafic-free or mafic-poor and sulfide- and iron oxide-free varieties of anorthosite make an attractive light to medium gray crushed rock that may be suitable for decorative aggregate, particularly in precast concrete, terrazzo, or polymer interior panels. The Laramie Mountains Anorthosite is the largest body

of gray rock in Wyoming, and, especially if other colors of rock are produced in eastern Wyoming, it would make a good source of light gray decorative aggregate.

The rock cuts well and takes a high polish. It is potentially useful for building stone, facing, or monument stone. Local areas may be free of fractures, sulfides, and iron oxide minerals, and suitable for quarrying operations. In the southern anorthosite, an accessible and relatively fracture-free body occurs along the Horse Creek Road in secs. 1, 2, and 3, T.16N, R.71W. Another possible locality for a dimension stone quarry is in the alumina test pit in sec. 1, T.16N, R.72W. Grey stone is common in the United States, particularly in major stone-producing areas such as northeast Georgia and southwestern Minnesota (David Bailey, Decherd Marble and Granite, personal communication, 1989). However, if a decorative stone industry started in Wyoming, using the many colors and varieties of rock found in the state, this area would be highly suitable for producing gray stone.

Feldspar, the major component of anorthosite, is an industrial mineral with a variety of uses. It is used in ceramics, as an ingredient in glass, and in metal smelting, as fluxing agent (Potter, 1989).

Magnetite sand is used in the eastern United States in the process of removing sulfur from the high-sulfur coals in that area. Specifications for magnetite sand are given in **Table 1**. The magnetite bodies associated with the Laramie Mountains Anorthosite may make a source of magnetite sand for the eastern coal-precessing industry. The current source of magnetite, a mine in upstate New York, is nearing depletion (John Kuhn, Koch Industries, personal communication, 1988). Magnetite from some of the larger bodies within the anorthosite should be tested for suitability for magnetite sand production.

Table 1. Test specifications for magnetite sand used for coal processing (Kuhn, 1989).

Test name	Maximum	Preferred	Reject
Davis Tube (% magnetics)	100% magnetic	96% magnetic	92% magnetic
Specific gravity	5.18	4.96	4.80
Fe Oxide analysis	72.36%	69.5%	66.5%
X-Ray analysis of Fe_3O_4	100%	95%	90%

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