U.S. Geological Survey Fact Sheet

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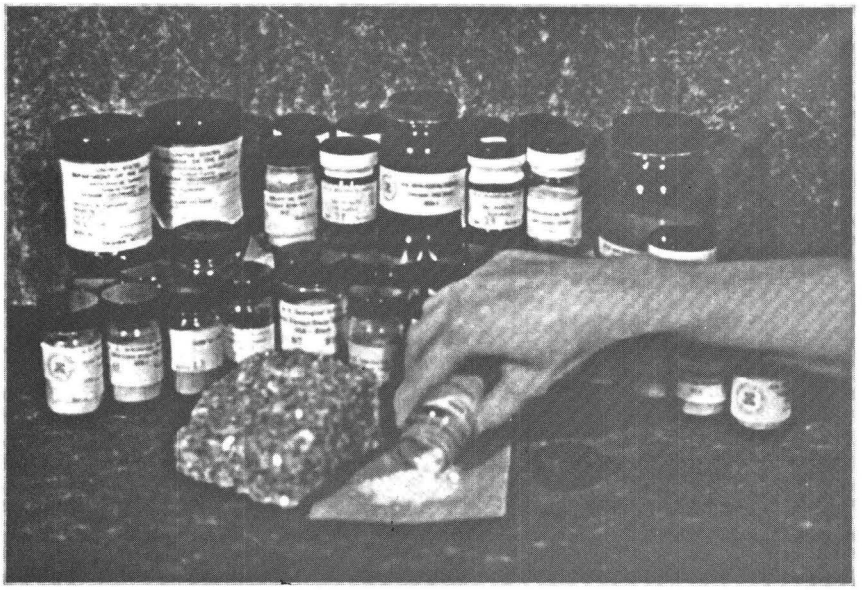
USGS reference materials

Every year in the United States, millions of measurements are made on the chemical composition of items that affect us on a daily basis. Determining the accuracy of these measurements is based on the analysis of appropriate reference materials whose composition was previously determined through rigorous testing. Today, reference materials help us evaluate the composition of the food we eat, medicine we use, soil we grow our crops in, and hundreds of other products that affect our everyday lives.



In the field of earth science, reference materials are particularly important because they help us develop a better understanding of the processes that have, and continue to, shape the world around us. Despite the importance of geologic reference materials little more than four decades ago, reliable reference materials for silicate rocks were unavailable. It wasn't until 1951 that the Massachusetts Institute of Technology and the U.S. Geological Survey (USGS) cooperated to develop reference materials G-1 (granite) and W-1 (diabase)—producing the first readily available supply of well-characterized silicate rock material. This early effort has since led to the development of 19 additional standards. At the present time, USGS reference materials are distributed internationally at minimal charge to established public and private organizations involved in geochemical analysis. Current estimates indicate that over 20,000 units of USGS reference materials have been distributed since the program's inception.

The majority of USGS reference materials continues to be silicate rocks that were collected from the continental United States and Hawaii. These reference materials range in composition from volcanic basalt to sedimentary shale. Our selection of reference materials has also diversified in response to changes in national needs, requests from other Government agencies, and inquiries from private industries. This diversification is driven by the need to match reference materials with sample type. Requests from the oceanographic community led to the development of a coastal marine sediment and two deep ocean manganese nodule standards. Inquiries from the mining industry initiated the development of our exploration standards (GXR's). These standards contain elevated concentrations of certain metals and are used extensively to help in the discovery of ore deposits. In response to specific environmental studies we have developed a freshwater-sediment standard

that has a high concentration of extractable selenium. This standard is useful in western agricultural studies in which selenium in agricultural runoff can be significant. Reference standards to be released in the near future include gold-ore and whole-coal standards that were developed cooperatively with the mining and energy industries.

In addition to the development of our own reference materials, the USGS also assists other Federal agencies in the preparation of their standards. The Bureau of Reclamation has used our expertise to develop their own internal reference materials, and the National Institute for Standards and Technology (NIST) has made extensive use of USGS capabilities. To date, 11 reference materials have been prepared for NIST.

The use of reliable reference materials by the public and private sectors will continue to expand in the future and become an integral part of international efforts to standardize analytical capability. In response to this global need the USGS reference material program will continue to produce relevant and well-characterized geologic standards that will lead to a better understanding of the world we live in. ❑

Available USGS reference materials

Sample type	Designation	Collection location
Andesite	AGV-2	Oregon
Basalt	BIR-1	Iceland
Sediment	BSK-1	California
Coal	CLB-1	Kentucky
Gold ore	DGPM-1	Nevada
Dolerite	DNC-1	North Carolina
Dunite	DTS-2	Washington
Marine mud	MAG-1	Maine
Manganese nodule	NOD-A1	Atlantic Ocean
Manganese nodule	NOD-P1	Pacific Ocean
Quartz latite	QLO-1	Oregon
Rhyolite	RGM-1	California
Mica schist	SDC-1	Washington, D.C.
Shale	SCO-1	Wyoming
Shale	SDO-1	Kentucky
Shale	SGR-1	Wyoming
Syenite	STM-1	Oregon
Diabase	W-2	Virginia
Jasperoid	GXR-1	Utah
Soil	GXR-2	Utah
Hot-spring deposit	GXR-3	Nevada
Copper mill-head	GXR-4	Utah
Soil	GXR-6	North Carolina
Standards in production		
Basalt	BHVO-2	Hawaii
Granodiorite	GSP-2	Colorado
Basalt	BCR-2	Oregon
Sediment	BSK-1	California

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