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SPECTROGRAPHIC DETERMINATION
OF CONTAMINATION OF ROCK SAMPLES
AFTER GRINDING WITH ALUMINA CERAMIC

By P. R. Barnett, W. P. Huleatt, L. F. Rader, and A. T. Myers



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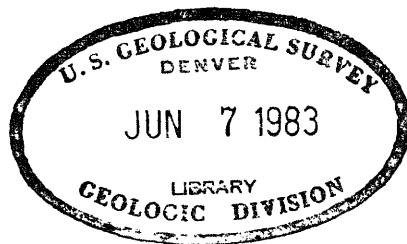
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By P. R. Barnett, W. P. Huleatt, L. F. Rader, and A. T. Myers

As a previous study by Myers and Barnett (1953) had shown that rock samples pulverized in heavy grinding machinery were contaminated with tramp iron containing certain alloying elements used in the manufacture of steel, a search was started for suitable materials to substitute for steel grinding plates. Arrangements were made with the Coors Porcelain Co., Golden, Colo., to make experimental grinding plates from a high-alumina base. This material is relatively pure, particularly with regard to alloying elements of steel, and is very hard and durable. One set of alumina-ceramic grinding plates ground about 1,400 two-ounce rock samples to -80 mesh before replacement was necessary. Thus the grinding of rock samples with the ceramic material was successfully demonstrated as a means of rapid preparation of samples for spectrographic analysis and is now standard practice in one grinding laboratory of the Geological Survey.

Figure 1 shows the grinder with a set of plates attached and ready for use. The bottom plate is attached to the vertical rotating shaft of the grinder by means of a tapered steel bushing through the center of the plate. This plate is supported and strengthened by an aluminum housing machined to hold it firmly in place. Two steel taps are inserted diagonally opposite each other in the upper plate near its edge to receive bolts that hold the plate stationary when mounted in the grinder. A second set of ceramic grinding plates is shown in the right foreground of figure 1.

The pan to catch the ground sample is also shown. This pan is made of aluminum to prevent sample contamination by other metals.

To determine the kind and degree of contamination introduced by the ceramic grinding plates, selected vein quartz (massive) and quartzite samples from the same source as the samples used in the previous study (Myers and Barnett, 1953) were used. As in the previous study, control portions of the rocks were ground to -100 mesh in agate and analyzed spectrographically to compare with splits pulverized to -100 mesh with the ceramic grinding plates. The method of analyses was that described by Fleischer et al. (1952).

The quantitative data in table 1 show the effectiveness of the ceramic in preventing contamination of rock samples, especially with respect to iron and the other elements usually found in steel.

Note.--The authors are designing a new type of grinder for use with the alumina-ceramic grinding plates for pulverizing rock samples under conditions that are even less subject to metal contamination than the present system.

REFERENCES

- Fleischer, Michael, Murata, K. J., Fletcher, J. D., and Narten, P. F., 1952, Geochemical association of niobium (columbium) and titanium and its geological and economic significance: U. S. Geol. Survey Circ. 225.
- Myers, A. T., and Barnett, P. R., 1953, Contamination of rock samples during grinding as determined spectrographically: Am. Jour. Sci., v. 251, p. 814-830.

Table 1.--Qualitative spectrographic analysis comparing contamination of quartzite and massive quartz by grinding with ceramic and with steel (in percent).

Element	Quartzite			Massive quartz		
	Spec. determination grinding in agate	determination after grinding with ceramic	Contamination by ceramic steel 1/	Spec. determination grinding in agate	determination after grinding with ceramic	Contamination by ceramic steel 1/
Co	0	0	0.0002	0	0	0.0003
Cr	0.0003	0.0002	0.0009	0	0	.001
Cu	0	.0003	.0003	0	0.0001	.001
Fe	1.0	1.0	.9	0	0	1.5
Mo	0	0	.001	0	0	.002
Mn	.0006	.0006	.006	0	0	.01
Ni	0	0	.003	0	0	.006
V	.0004	.0004	.0005	0	0	.0007
Ba	-	-	-	0	0	-
Ca	.04	.04	-	0	0	-
La	.02	.02	-	0	0	-
Mg	.007	.01	-	<.001	.003	-
Na	.04	.04	-	0	0	-
Sr	.002	.002	-	0	0	-
Ti	.04	.04	-	.0002	.0003	-
Y	.005	.005	-	0	0	-
Zr	.01	.01	-	0	0	-

1/ Data from Myers and Barnett (1953).

Also looked for but not found in the control, and not found as a contaminant after grinding with ceramic: P, Ag, As, Au, B, Be, Bi, Cd, Ce, Co, Dy, Er, Ga, Gd, Ge, Hf, Hg, In, Ir, Li, Mo, Nb, Nd, Ni, Os, Pb, Pd, Pt, Re, Rh, Ru, Sb, Sc, Sn, Sm, Ta, Te, Th, Tl, U, W, and Zn.

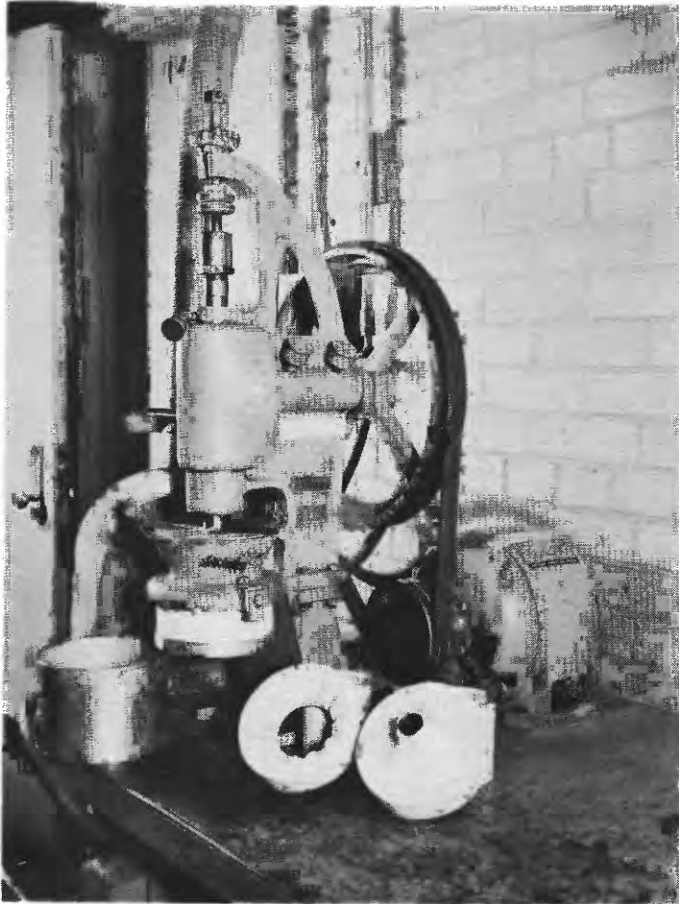


Figure 1.--Grinder with set of ceramic plates attached.

A second set of plates is in the foreground.