with 1-layer structures more common. The fibrous gümbelite described by Aruja (1944) as occurring in veinlets in slate is of the $2M_1$ type, however, and the stability of this polytype, recently discussed by Velde (1965), evidently extends to relatively low temperatures.

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A CONVENIENT NONOXIDIZING HEATING METHOD FOR METAMICT MINERALS[1]

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Abstract

Heating metamict minerals in a nonoxidizing atmosphere for X-ray study is facilitated by a technique using charcoal rather than the customary tube furnace.

Metamict minerals generally can be identified by X-ray diffraction after they are heated under certain time and temperature conditions necessary to produce crystallinity. Diagnostic patterns are commonly obtained by heating the sample for 1 hour at 1000°C in air, in which case the crystalline phases developed may include those promoted by an oxidizing atmosphere. This is the "standard" heating procedure suggested by Lima-de-Faria (1956). In some instances, however, it is desirable to heat the sample in a nonoxidizing atmosphere, and for this purpose investigators have generally used a tube furnace through which a stream of nitrogen or helium is passed (Bannister and Horne, 1950; Lima-de-Faria, 1964).

Inasmuch as setting up and operating the tube furnace may be quite inconvenient and time-consuming, we have tried a practical alternative

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method of obtaining a nonoxidizing atmosphere that seems to give results comparable to those obtained in the tube furnace. This method consists simply of placing mineral fragments to be heated in a small ceramic crucible which in turn is placed in a larger crucible with a close-fitting cover. Fragments of charcoal are set around the smaller crucible and the cover put in place. The sample is then heated in an electric furnace. We have been employing crucibles with capacities of 1 ml and 15 ml, and using charges of about 1 gram of charcoal fragments. The atmosphere in the crucible during heating will consist largely of nitrogen together with some carbon monoxide, whose presence will cause the environment to be slightly reducing.

Allanite, chevkinite, and ilmenite were heated for 1-hour periods in air and with charcoal in order to compare the heating products obtained with those made in the nonoxidizing atmosphere in tube furnaces. Allanite gives an X-ray diffraction pattern containing the strong lines of CeO_2 after being heated in air at 1000°C; however, on heating with charcoal a very different pattern is obtained, which is similar to that given by the lessingite (britholite) phase described by Lima-de-Faria (1964, p. 31 and Tables 5 and 7) for allanite heated at 1000°C for 1 hour in nitrogen. Although the original structure of metamict allanite can commonly be restored by heating at temperatures of 700°C or less, some highly metamict samples failed to recrystallize. Heating such samples to 1000°C in air to obtain the CeO_2 phase and in the nonoxidizing environment to obtain the britholite phase may be useful for identification.

Metamict chevkinite is converted in part to perrierite when heated in air (Lima-de-Faria, 1962). Perrierite lines were not identifiable in the pattern of chevkinite heated with charcoal or in that of chevkinite heated with nitrogen in the tube furnace.

The conversion of ilmenite to pseudobrookite has been used as a test of oxidation during the heating of metamict minerals (Bannister and Horne, 1950, p. 110). As an additional test of the charcoal-heating technique, samples of ilmenite from the Ishpeming quadrangle, Michigan, were heated at 1000°C for 1 hour both in air and in covered crucibles with charcoal. The X-ray diffraction pattern of the air-heated sample showed strong lines of pseudobrookite and rutile in addition to those of ilmenite. The pattern of the sample heated with charcoal showed only ilmenite lines.

We have made only a few experiments with metamict multiple oxide minerals, but these suggest that heating such minerals both in air and with charcoal may be of value not only for identification purposes but also for the investigation of the variations in crystalline phases produced by the different heating environments.

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91	Differentiation	dolomites	dolerites
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179	Kubisz	$FeSO_4 \cdot H_2O$	Rozenite, $FeSO_4$
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230	Kozhanovite	(add reference:)	**42**:120
227	(New mineral name:)	alovotantalite	(delete entry)
230	(New entry:)	lodochnikovite	**42**:307; **43**:1007
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261	Petrography	(New entry:)	macallisterite, **50**:632
286	Moshier	Dinnen	Dinnin

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302	Schiller	coticulites	coticules
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