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EARTHY MONAZITE AT MAGNET COVE, ARKANSAS*

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Monazite is usually found as well-formed euhedral crystals ranging in size from fractions of a millimeter to several centimeters. Rare instances of massive monazite are mentioned in Dana's System of Mineralogy (Palache, Berman, and Frondel, 1951, pp. 694–695). This note reports on an unusual earthy form of this mineral.

A very irregular vein, 2 to 8 inches wide, of earthy, fine-grained, pale greenish-yellow monazite is found in the extremely weathered portion of an apatite-pyrite vein in the carbonatite of East Tufa Hill at Magnet Cove, Arkansas.

The material is too fine grained for satisfactory index measurements, but it is birefringent with a mean index of 1.81. Spectrochemical analysis indicates large amounts of cerium earths and phosphorus. From *x*-ray powder patterns the material is identified as mostly monazite with a small amount of a mineral of the plumbogummite (?) group, perhaps florencite(?), $CeAl_3(PO_4)_2(OH)_6$. Electron micrographs (Fig. 1) of the eartly monazite show irregularly shaped crystals or aggregates of crystals averaging about 0.5 micron in diameter. A few rod-shaped particles are present and may be the plumbogummite (?) mineral indicated by the *x*-ray patterns. These rod-shaped particles comprise several per cent of the sample.

This unusually fine grained monazite is believed to be a product of weathering of the rare-earth bearing apatite of the vein. Monazite has not been found as an original constituent of the vein. The proportions of the major rare-earth elements (atomic per cent) in apatite and monazite have been determined quantitatively by spectrochemical analysis as follows:

	La	Ce	Nd	Y
		(atomic per cent)		
Apatite	38	48	10	4
Monazite	44	44	10	2

The high proportions of lanthanum and cerium in both minerals are characteristic of cerium-earth minerals associated with alkalic rocks (Murata et al., 1957). Although there are variations in the relative amounts of these major rare-earth elements, the general similarity in composition indicates that apatite could have been the source for the

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rare earths in the earthy monazite. The monazite exhibits a slight increase in the relative amount of lanthanum, and a marked decrease in yttrium. This differentiation may be explained by the process of fractional crystallization which takes place during the formation of monazite in carbonatites. The larger ions of the cerium-earth group (atomic nos. 57–64) are preferentially accommodated in the monazite structure where a ninefold coordination of the rare-earth ion is required.

Another notable feature of the monazite is the absence of thorium, which was not detected by a spectrographic method sensitive to 0.1 per

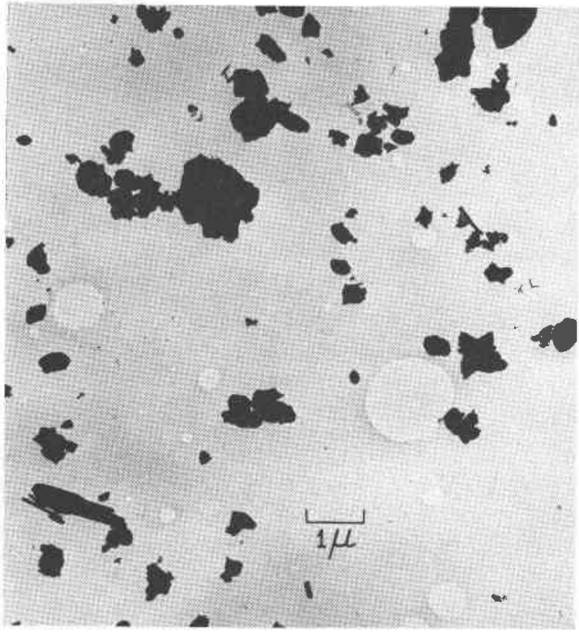

FIG. 1. Earthy monazite, Magnet Cove, Arkansas. Electron micrograph.

cent Th. Monazite derived from granitic rocks and crystalline schists invariably contains more than 3 per cent thorium, commonly 4 to 10 per cent. Monazite from another area of alkalic rocks, namely the Mountain Pass district of California, is also low in thorium according to Jaffe (1955) who reports 2 to 3 per cent in 3 samples. Therefore, a low content of thorium as well as yttrium may be characteristic of monazites from alkalic rocks. However, thorium-poor monazites have also been described from Bolivian tin veins (Gordon, 1944) and from replacement veins at pegmatite-schist contacts in Colorado (Goddard and Glass, 1940) indicating that such monazites are not restricted to alkalic rocks.

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LOW MAGNIFICATION THIN SECTION PHOTOGRAPHY

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INTRODUCTION

The method whereby photographs of thin sections are made by using a photographic enlarger instead of a microscope is not original, but is not widely known and is seldom used. The method has advantages which warrant further publication, so that its use will become more general.

Crooks (1938), briefly recorded the method, but did not stress its advantages. His account limited its application to plain light photographs and to use of a particular type of enlarger. This paper discusses the method in detail, lists its advantages and limitations, and describes the technique of making photographs with "crossed" polarized light, as well as with plain light.

METHOD

For plain light photographs no special photographic equipment or attachments are required. Only a dark room, a standard photographic enlarger, and one or more 4″×5″ sheet film holders are needed. The Leitz and other enlargers designed for roll film can be used, but they are not readily adaptable for making crossed nicol photographs. The Omega enlarger which will handle a 4″×5″ negative was found to be ideal. Most enlargers come equipped with 35 mm. negative holders made of metal. But as there is a danger of breaking the thin sections in a metal holder