

NOTES AND NEWS

HYDROTHERMAL SYNTHESIS OF MONAZITE

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Monazite was first synthesized by Radominski in 1875. His method consisted in fusing CePO_4 in an excess of CeCl_3 . Recent syntheses have been reported. Mooney (1948) worked with powders of the rare earth phosphates whose method of preparation was not specified. Karkhanavala (1956) produced CePO_4 by heating $\text{Ce}(\text{NO}_3)_3 \cdot 4\text{H}_2\text{O}$ and $(\text{NH}_4)_2\text{HPO}_4$ to about 200°C . The washed product when sintered at 700°C . gave the monoclinic dimorph of CePO_4 corresponding to monazite. The size of crystals was not specified.

In the present investigation single-crystals of monazite have been synthesized hydrothermally in bombs at temperature as low as 200°C . Cerium hydroxide gel was precipitated from an aqueous solution of ceric ammonium nitrate with an excess of ammonium hydroxide and thoroughly washed. A charge consisting of the dried gel and an excess of 85 per cent phosphoric acid was heated in a lead-sealed, stainless steel bomb equipped with a Teflon liner and cap. Teflon was found to provide an excellent liner material at the temperatures used because of its chemical inertness and good machining characteristics. Runs of 48 hours at 300°C . produced crystals up to 0.7 mm. measured along the c axis. The majority of crystals occur as clumped masses clinging to the liner walls, but many doubly-terminated, untwinned individuals having clean, bright faces have been observed.

Preliminary results suggest that thorium can be introduced into solid solution in synthetic monazite. Crystals have been grown by the method outlined with Si present in the form of $\text{Na}_2\text{SiO}_3 \cdot 9\text{H}_2\text{O}$ solution and the Th present as ThO_2 gel. The unit cell dimensions of the resulting crystals were determined by the powder method and showed significant variations from those of pure synthetic monazite. The content of Th in the crystals is not known, however, and this aspect of the study is being continued.

REFERENCES

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