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PRELIMINARY SOLUBILITY MEASUREMENTS OF $CePO_4$ AND YPO_4 IN H_2O, H_2O-NaCl, H_2O-NaF AND H_2O-Albite AT 800°C AND 1 GPa: IMPLICATIONS FOR THE TRANSPORT OF REE DURING HIGH-GRADE METAMORPHISM

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Monazite ($CePO_4$) and xenotime (YPO_4) are widespread accessory minerals in metapelites and metgranitic rocks and are considered to be important carriers concerning geochronological and petrological information about a metamorphic overprint. Although the distribution of rare earth elements (REE) during high-grade metamorphism has long been a subject of intense research (e.g. Pan and Fleet, 1996), experimental investigations on monazite solubility at high P-T are scarce (Ayers and Watson, 1991; Ayers et al., 2001). Therefore, understanding the solubility behaviour of $CePO_4$ and YPO_4 under high-grade P-T conditions is essential for the interpretation of REE distribution patterns in high-grade rocks. In order to set constraints on the solubility of $CePO_4$ and YPO_4 under high-grade P-T conditions, we carried out a series of weight-loss experiments of single crystals of synthetic $CePO_4$ and YPO_4 in a piston-cylinder apparatus at 800°C and 1 GPa. The $CePO_4$ and YPO_4 crystals were grown from a Pb-free flux at a temperature of 1280°C for 15 hours, which was then cooled down to 870°C with a cooling rate of 3°C per hour. In our experiments we used Pt capsules, with a OD of 3.5 mm and the crystals were placed in an inner envelope of Pt. The solubility of $CePO_4$ and YPO_4 has been measured not only in H_2O but also in H_2O-NaCl, H_2O-NaF and H_2O-albite. The data indicate that the concentration of both, $CePO_4$ and YPO_4 dissolved in H_2O is very low ($CePO_4$: 0.0006 mol/kg H_2O, YPO_4: 0.0002 mol/kg H_2O) but $CePO_4$ solubility increases strongly with increasing NaCl to 0.0059 mol/kg H_2O at X_{NaCl}= 0.3. Solubility of YPO_4 only increases moderately to 0.0033 mol/kg H_2O at the same X_{NaCl}, thus indicating a different solubility behavior of the two phosphates. The addition of 10 wt.

(1) Ayers, J. C., Watson, E. B. (1991): Phil. Trans. Roy. Soc. Lond., 335, 365-375. (2) Ayers, J. C. et al. (2001): 11th Ann. V. M. Goldschmidt Conf., 3475. (3) Pan, Y., Fleet, M. (1996): Contrib. Mineral. Petrol., 123, 251-262.