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Pb diffusion in monazite: New constraints from the experimental study of $Pb^{2+} \Leftrightarrow Ca^{2+}$ interdiffusion

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We performed diffusion annealings of Pb-brabantite – Nd-monazite solid solution thin films deposited on Ca-brabantite – Nd-monazite solid solution polycrystals in order to investigate $Pb^{2+} \Leftrightarrow Ca^{2+}$ interdiffusion. Experiments were performed at temperatures ranging from 1300 to 1500˚C, samples sealed in Pb-buffered capsules. The Focused Ion Beam (FIB) technique have been used to cut TEM foils within grains, excluding boundaries, in order to scan volumic diffusion profiles using EDX analysis. The Arrhenius law we determined is in agreement with those of the two previous experimental studies of Cherniak et al. (2004) and Gardés et al. (2006):

E = 445 $\pm$ 100 kJ mol^{-1}

logD_0(m^{2}s^{-1}) = -5.33 $\pm$ 3.06

The result of this new diffusive exchange proves that Pb diffusion had been measured in the three cases. This third study removes any ambiguity and confirms the two previous one: most of the perturbations in U-Th-Pb ages of monazite cannot be attributed to Pb diffusion.

Cherniak D. J., Watson E. B., Grove M., and Harrison T. M. (2004) Pb diffusion in monazite: A combined RBS/SIMS study. *Geochim. Cosmochim. Acta* **68**, 829–840.

Gardés E., Jaoul O., Montel J. M., Seydoux-Guillaume A. M. and Wirth R. (2006) Pb diffusion in monazite: An experimental study of Pb^{2+} + $Th^{4+} \Leftrightarrow 2Nd^{3+}$ interdiffusion. *Geochim. Cosmochim. Acta* **70**, 2325–2336.