# On the use of $Zn^{2+}$ to trace the reaction progress of forsterite hydration

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Closed-system forsterite hydration leads rapidly to the formation of secondary talc, serpentine, brucite and Fe-oxides (magnetite, hematite), oxidation of $Fe^{2+}$ and the splitting of $H_2O$ into molecular hydrogen [1, 2]. The amount of hydrogen generation depends on how much of the released $Fe^{2+}$ that is oxidized and incorporated into the secondary minerals. This amount is not always easy to trace, and the potential for hydrogen generation may therefore be difficult to predict.

We suggest to use trace metals released from olivine to track the rate and amount of $Fe^{2+}$ released, and to compare this to the amount of hydrogen generated. In our first experiments we used the release of $Zn^{2+}$ from Fo96 (Åheim mine, Norway) and estimated the concentration (mole fraction) in the olivine to be approximately 260 ppm. In our low-temperature batch experiments (30, 50, and 70°C) we observed a rapid initial leaching of $Zn^{2+}$ followed by a linear release (Fig. 1a). Molecular hydrogen was suggested to form at the highest temperature, also with an initial rapid generation followed by a linear increase in the batch reactors (Fig. 1b) [3]. In the next step, we will use Henry´s law, aqueous solution and head-space volumes, the measured hydrogen concentraion, and the estimated released $Fe^{2+}$ to estimate the fraction of $Fe^{2+}$ oxidized and incorporated into the secondary minerals.

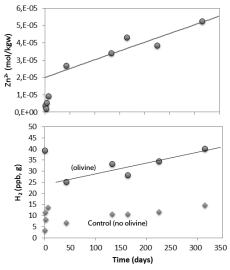


Fig. 1. Batch olivine hydration experiment: (a) Zn2+ concentrations; and (b) gas-phase hydrogen concentration.

[1] Hellevang, H. 2008. *Int. J. Astrobiology* **7**, 157; [2] McCollom, T.M., Bach, W. 2009. *GCA* **73**, 856; [3] Neubeck, A., *et al* accepted. *Planet. Space Sci.*