Calculated hydrous granite solidi beyond the albite-jadeite transition

D.P. MILLER*, M.J. CADDICK, A.C. HACK
AND A.B. THOMPSON

Institute for Mineralogy and Petrology, ETH Zürich, 8092 Zurich, Switzerland
(*correspondence: david.miller@erdw.ethz.ch)

The presence or absence of connected melt or fluid dramatically changes rheological behaviour, underpinning the conclusions of many recent geodynamic studies. However, the wet solidus for typical hydrous granite at high-pressure (> 2.0 GPa) is currently calculated at far higher temperature [e.g., 1] than measured experimentally [e.g., 2] when calculated with an 8-oxygen melt model. At 3.5 GPa the difference between the modelled and experimental solidus is approximately 225 K with obvious consequences for geodynamic and geochemical modelling.

Incorporating a pyroxene-like melt end-member within existing haplogranitic models dramatically decreases this disparity and yields reasonable melt compositions up to at least 3 GPa. Calculations using a simple solute-bearing fluid model initially shift the solidus to even higher temperature, exacerbating the problem. Despite this, available mineral solubility data suggest that it is important to integrate even a simplified solute-bearing fluid model into thermodynamic calculations for understanding mass transport in high-P environments. Thus, we present coupled thermodynamic models for hydrous aluminosilicate melt and aqueous fluid at pressures higher than 1 GPa. During model calibration it has become clear that several important P–T–composition regions are poorly constrained by existing experimental data.

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Are oxygen triple isotope ratios of the lunar regolith distinctive from those of lunar basalts?

M.F. MILLER[1,2]*, K. BURTON[3], R.C. GREENWOOD[1]
AND A. GANNOUN[4]

[1]Planetary and Spaces Sciences Research Institute, The Open University, Walton Hall, Milton Keynes MK7 6AA, UK
(*correspondence: m.f.miller@open.ac.uk)
[2]British Antarctic Survey, High Cross, Madingley Road, Cambridge CB2 0ET, UK
[3]Department of Earth Sciences, University of Oxford, Parks Road, Oxford OX1 3PR, UK
[4]LMV OPGC, Université Blaise Pascal, UMR 6524, 5 Rue Kessler 63038, Clermont Ferrand, France

High precision measurements of $\delta^{17}O$ and $\delta^{18}O$ in lunar basalts, anorthosites, volcanic glasses and breccias have demonstrated coincidence with the oxygen triple-isotope fractionation line that characterises terrestrial silicates [1, 2]. The discovery that metallic grains in the lunar regolith host implanted oxygen which is remarkably enriched [3] or depleted [4] in ^{16}O has been interpreted as a solar wind component. More recently, it has been suggested [5, 6] that the enrichment in ^{16}O could alternatively (or additionally) be attributed to an 'Earth wind' flux of O^+ escaping from the Earth's ionosphere. On this basis, it was postulated [6] that investigation of surface implanted light elements such as O in lunar soils could yield new insight into the evolution of O_2 in the terrestrial atmosphere. We report here high precision $\delta^{17}O$ and $\delta^{18}O$ measurements of bulk (~1mg) lunar regolith samples, for comparison with the terrestrial silicates fractionation line as determined in the same laboratory [7, 8]. The results are discusssed in conjunction with combined siderophile element abundances and Re-Os isotope systematics [9], which provide an indication of major chondritic contributions to the lunar regolith samples.

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