

## Sulfide controls on chalcophile element behavior in the Earth

B.J. WOOD<sup>1</sup>; E.S. KISEEVA<sup>12</sup>, D.J. SMYTHE<sup>13</sup>

<sup>1</sup>Earth Sciences, U. Oxford, UK; bernie.wood@earth.ox.ac.uk

<sup>2</sup>kate.kiseeva@earth.ox.ac.uk

<sup>3</sup>duane.smythe@earth.ox.ac.uk

Sulfur and sulfides have very powerful traction over the partitioning behavior of a wide range of economically and geochemically important elements. We have recently developed a simple model describing liquid sulfide/silicate partitioning of chalcophile elements[1] and have extended it to lithophile elements such as U, Th and the REE [2, 3] which partition strongly into sulfide under reducing conditions. We find that partition coefficients depend primarily on the FeO content of the silicate melt and valency of the trace element but that dissolution of oxygen into the sulfide (at high FeO content) and of sulfur into the silicate (at low FeO content) are also major controlling factors. The systematisation of the data enable us to model a wide variety of geochemical scenarios — primary mantle melts and their differentiation, the compositions of putative Hadean mattes, sulfur oxidation state and sulfur iron-interactions in melts for example.

We are currently performing experiments on liquid sulfide-MSS partitioning in order to extend our partitioning model into the sulfide subsolidus, <1300K. Results to date demonstrate that partitioning into solid sulfide is controlled by charge on the ion, 2+ ions being the most compatible and lattice strain as previously applied to crystal-silicate melt partitioning[4]. We are therefore now in a position to model the effects of crystallisation of sulfides in low temperature arc magmas.

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4. Blundy, J.D. and B.J. Wood, *Nature*, 1994. **372**: p. 452-454.