Partitioning of As, Se, Te and Bi between sulphide and silicate liquids

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In 2 recent papers [1], [2] we showed that partitioning of most elements between sulphide and silicate melts is a strong function of the FeO content of the silicate melt and of the oxygen content of the sulphide. Based on the exchange reaction between element oxide in the silicate melt and FeS we developed a comprehensive model to describe chalcophile and lithophile element partitioning between sulphide and silicate liquids. This model applies to the following elements: Pb, Cd, Ag, Co, Ni, Cu, Mn, Zn, V, In, Cr, Sb, Tl, Ga and Ge [1].

In addition to the simple general relationship between $\log D_M$ and FeO content of the silicate melt, we showed that at low FeO contents (<1 wt%) of the silicate liquid, strongly chalcophile elements, like Cu and Ag show a concave downward curve on a plot of logD versus log [wt%FeO]. In contrast, a number of lithophile elements, like Nb, Ta, Ce and Ti show concave upward behaviour [2].

In this study we expand the model for As, Se, Te and Bi. We show that over the range of FeO contents of the silicate liquid between 0.25 and 40 wt%, Se and Te behave similarly to Cu and Ag, and have a pronounced concave downward distribution on the logD vs log[wt%FeO] plot, while the partition coefficients for As and Bi exhibit near-linear behavior, more like Pb In and Cd [1].

Over the range of FeO contents between 6 and 14 wt%, DAs = 22-36, DSe = 350-850, DBi = 800-1250 and DTe = 2300-3800.

[1] Kiseeva, E.S., and Wood, B.J. (2015) EPSL 424, 280–294.

[2] Wood, B.J., and Kiseeva, E.S. (2015) AmMin 100, 2371–2379.