On the behavior of Sb and As in hydrothermal systems from the Manus basin, Papua New Guinea

N. BLAAUWBROEK[1], M. KEITH[2], S. PETERSEN[3] AND W. BACH[1]

[1]Geoscience Department and MARUM, Universität Bremen, Klagenfurterstraße GEO, Bremen, Germany (nikki.blaauwbroek@uni-bremen.de)
[2]Universität Erlangen-Nürnberg, Schlossgarten 5, Erlangen, Germany
[3]GEOMAR, Kiel, Germany

Introduction + Methods

The Manus basin is a young and rapidly opening back-arc basin and has been considered a typical setting, in which VMS deposits may have formed. Water and rock samples were collected from different hydrothermal areas in the eastern Manus Basin to assess the effects of variable magmatic fluid inputs and crustal composition on vent fluid geochemistry in relation to arc vicinity. We measured trace element contents (Au, Ni, Cr, Pt, Co, Cu, Zn, As, Se, Mo, Ag, Cd, Sb, Te, W, Pb, Bi) of sulfides by LA-ICP-MS. Vent fluid compositions [1, 2] were used to compute the speciation of Sb and As and the solubility of solids incorporating these metalloids. Whole rock analyses were employed to determine the distribution of Sb and As in polymetallic massive sulfides.

Results + Discussion

Vent fluid temperatures and pH vary between 100 and 350°C, and 1 and 5, respectively, but As and Sb are most enriched in fluids with T=250-270˚C and pH=2-3. The main host phase of As is tennantite, occurring as inner conduit lining along with chalcopyrite, and As contents are as high 2.7 wt.% in the bulk sulfide samples. Sb-minerals are not present, but Sb may partition into tennantite, leading to As-Sb correlations in Cu-rich massive sulfides. More commonly, Sb enrichment (to 0.22 wt.%) is observed in Zn-Fe-Ba-rich beehive chimneys. Increased contents of both metalloids is restricted to black smoker systems from felsic basement (PACManus, South Su). Acid-sulfate vents (at Desmos and North Su) and the basalt-hosted Vienna Woods vent field have exceedlingly low Sb and As contents. The two metalloids may be useful index elements in exploration, as both fluids and solids reveal tight relations between Sb and Ag as well as As and Au.

[1] Reeves et al., (2011) *GCA* **75**, 1088-1123. [2] Craddock P (2010), PhD Thesis, MIT