Formation and metamorphism of the Upper Sulfide Zone of the Salt River VMS deposit (South Africa)

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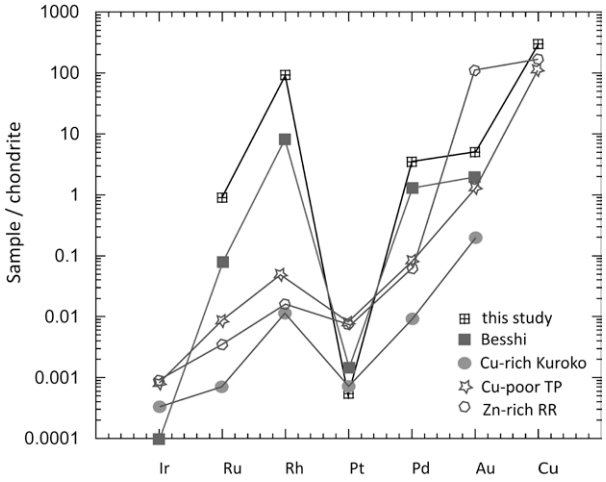
Sulfides from the upper sulfide zone of the Salt River VMS (South Africa) were analyzed for PGE (platinum group elements), Re, Au, Sb, As, Se, Te, Cr, Co, Ni, Mn, Mo, Ag, Hg and Pb using in-situ LA-ICP-MS (laser ablation-inductively coupled plasma-mass spectrometry) techniques. The analysis of a plethora of trace elements during the ablation of one single spot was possible by using a multi standard approach, involving the analysis of several external standards before, after and between the analysis of unknowns. Chondrite normalized PGE patterns best fit data from Besshi-type deposits, implying the formation within a back-arc basin environment.



This conlusion can be drawn although the Salt River VMS deposit experienced peak amphibolite metamorphism as metamorphism of the deposit was isochemical with respect to the PGE and Au.

Surface topography controls on calcite growth kinetics: From Molecular Dynamics simulations to macroscopic-scale modelling

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Cation dehydration is generally accepted to be the rate-limiting step to ionic crystal growth from aqueous solution. Our classical Molecular Dynamics simulations show a variation in water exchange frequency at structurally distinct calcium sites in the calcite surface of about two orders of magnitude. A process-based calcite growth kinetics model has been re-parameterized, using the water exchange frequencies computed from our molecular dynamics simulations, to represent the attachment frequencies of carbonate and bicarbonate ions. This calcite growth kinetics model illustrates the impact of variations in attachment frequencies on kink-formation frequency (Figure 1), step velocities and bulk growth rate. The calculated frequencies of kink formation show a strong variation with surface structures, which can be amplified further depending on the saturation state and calcium-to-carbonate ratio in the aqueous solution. Modelled and measured step velocities and bulk growth rates are generally in agreement, showing that surface topography might at least partially induce variations in calcite growth rates and step velocities as observed experimentally.

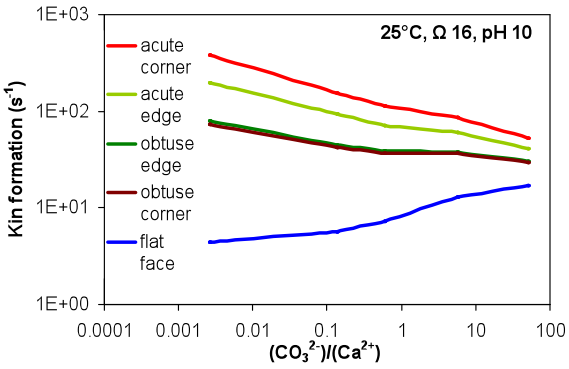

Figure 1: Variation in kink formation frequency with surface topography.

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