Garnet growth in the Zermatt-Saas Fee eclogites

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Different approaches have been used to infer the growth-limiting mechanism. The radius rate relations of e.g. Kretz (1973) rely on major element compositional zoning as time markers assuming that all porphyroblasts are precipitating the same chemical composition at any point in time. Comparison of chemical contour lines in variably sized garnets is used to distinguish between the different rate laws. A second approach is based on the 3-D spatial distribution of porphyroblasts. It assumes that depletion halos developing around early porphyroblast in the diffusion-controlled case will inhibit nucleation within the halos. This is supposed to lead to an ordered distribution while a random distribution is to expect for the interface-controlled case.

Application of the radius-rate concept to garnets of the eclogites of the Zermatt-Saas Fee ophiolite (ZSF, Western Alps, Switzerland/Italy) suggests that all garnets precipitated the same amount of radius per time interval, hence were grown limited by an interface-controlled growth mechanism. Approximately bell-shaped crystal size distributions suggest continuous nucleation and growth throughout the garnet growth history. Preliminary 3-D spatial distribution data using the nearest neighbour method point towards a random distribution, consistent with an overall interface-controlled growth mechanism, but tend towards an ordered distribution in rocks with higher modal abundance of garnet. This could be the case because new porphyroblasts cannot nucleate randomly if early crystallized garnets are abundant (e.g. Denison *et al.* 1997).

References

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Investigation of the interaction between green rust sodium sulfate and aqueous selenium

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Selenium is an important trace nutrient in the body at low concentrations but becomes toxic at high concentrations. It is a natural compound in many rocks and sediments in various concentrations, but selenium is also produced as a decay product in radioactive waste. It exists in various redox states of which the higher, selenate (VI) and selenite (IV) are mobile in the aquatic environment. Inorganic reduction to elemental, insoluble selenium is one pathway to minimize the bioavailibility of selenium in areas of increased levels.

Green rust is an Fe(II)-containing compound, known for its capability of reducing a large number of oxidised elements and compounds. It belongs to the family of layered double hydroxides (LDHs) with layers of Fe(II)-Fe(III) hydroxide, separated by interlayers of water, anions and for some types also cations (*poster by Christiansen et al.*). The reduction of selenate and selenite by green rust has been studied during the last decade. We have focused our investigations at the nanoscale level to understand the mechanism of the reactions. We use transmission electron microscopy (TEM), atomic force microscopy (AFM) and X-ray diffraction (XRD) to observe the particles at various times during the reactions.

Our results suggest that the mechanism of reaction is dependent on the type of green rust as well as the oxidation state of selenium. We used a green rust type which had SO_4^{2-} incorporated in the interlayers. When SeO_4^{2-} was added, we observed signs of intrusion into the interlayers. However, when SeO_3^{2-}, which has a different steric nature, was added, interlayer exchange was not observed. In both cases, the oxidised species were reduced to insoluble elemental selenium. Previous studies on chromate (Skovbjerg *et al.*, 2006) showed that the reduction mechanism is important for the mobility of the reduced contaminant, but in the case of selenium it appears not to be of relevance.

References

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