

## Texture formation in quenching of Fe-S-O micro melt spherules

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Microtexture of minerals records physical, chemical and kinetic conditions at crystal growth. Local processes at crystal growth and migration of elements have important role in the rapid crystal growth. Especially, Fe and S-bearing systems are oxidation and evaporation sensitive. And fine particles can be quenched very quickly from high temperature, quench crystals show characteristic textures of crystals. In this study, quick heating and cooling experiments of powdered iron sulfide particles were carried out with a fine particles free falling apparatus with controlled gas flow (Isobe and Gondo, 2013). Oxygen fugacity was controlled to FMQ -0.5, +0.9 or +2.4 log unit. Particles can be heated to the maximum temperatures of approximately 1600°C within two seconds, are kept approximately one second and quenched within a second.

Run products particles were completely melted and show rounded shape with smooth surface or characteristic texture. Spherical products were initially well homogenized from inhomogeneous starting materials by complete melting. Then, spherules are oxidized and show growth of secondary crystals with rapid cooling.

FeS dendritic crystals occur in sulfur-rich spherules with low  $fO_2$  condition. In the higher  $fO_2$  experiments, rapid growth of magnetite in Fe-O melt produces iron metal phase from an excess iron in melt phase relative to magnetite.

Compositions of iron sulfide melt in fine spherules are initially close to FeS and are losing S with oxidation following Fe-S-O phase relations depending on oxygen fugacity even in a few seconds. Crystallization of FeS crystals can reduce sulfur content in melt, then evaporation of sulfur can be suppressed. Evaporation of sulfur may be promoted by oxidation of iron sulfide melt to occur magnetite as liquidus phase.

Keywords: iron sulfide, magnetite, quench crystals, spherules, dendrite