New data of sulfur concentration at sulfide saturation in basaltic melt: influence of sulfide composition and water content

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Sulfur is an important volatile element in magmatic systems. Sulfur content at sulfide saturation (SCSS) controls when sulfide is consumed during mantle melting or when sulfide is precipitated during magma differentiation. SCSS has been experimentally investigated extensively for a wide range of temperature, pressure and melt composition, but the influence of chemical composition, especially the water content in silicate melt and the FeS content in sulfide, has not been constrained satisfactorily. In order to obtain SCSS more relevant for natural basaltic magma, 19 experiments of meltsulfide equilibria were carried out in a piston cylinder apparatus at 1.0-2.5 GPa and 1250-1400 °C. The investigated water concentation in the melt varied from anhydrous to 3.21 wt% and the molar ratio of Fe/(Fe+Ni) in sulfide ranged from 0.5 to 1. Our experimental results demostrate an increase of SCSS of approximately 110 ppm per wt% water in the melt. We also find that SCSS increases roughly linearly with the mole fraction of FeS in sulfide. The influence of water content in the melt and that of FeS content in sulfide appear to be independent and additive. A general model of SCSS for basaltic melt that accounts for the effects of melt H₂O, FeS contents in sulfide, temperature and pressure is under development.