



## **COS as an agent of sulfurization of the subduction related magmas.**

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Subduction related tholeiitic magmas are often generated in the asthenosphere at the lower pressure and higher temperature than andesitic ones. Tholeiitic magmas are also drier and more reduced. Fluids released from subducting slab may be dried passing through the lower zone of andesitic magmas generation since water is well dissolved in these magmas. Such dried fluids of the C-O-S composition would represent mainly CO<sub>2</sub> and COS mixture. We show this by means of thermodynamic modeling at the upper mantle pressure and oxygen fugacities in the range NNO-3/ NNO+0.5. Presence of CS<sub>2</sub> and CO in such fluid may makes it good carrier for PGE in the form of solvable π-complexes. Sulfurization of olivine rich rocks by COS is possible with orthopyroxene formation in accordance with reaction: Fe<sub>2</sub>SiO<sub>4</sub> + COS = 1/2 Fe<sub>2</sub>Si<sub>2</sub>O<sub>6</sub> +FeS +CO<sub>2</sub>. This equilibrium is affected by olivine and Opx compositions. In thermodynamic calculations we use Mg-rich composition of Opx and olivines observed in tholeiitic cumulates drawn as volcanic xenoliths to the surface. Thus we get high COS/CO<sub>2</sub> ratio (up to 140) in equilibrium with solid pyrrhotite. Required ratio is higher than calculated equilibrium COS/CO<sub>2</sub> ratio in C-O-S system implying stability of COS component in solid mantle. Sulfurization of the tholeiitic melt by COS may proceed in the zone of asthenosphere melting. In this moment PGE fluid load will be consumed by forming liquid FeS. Proposed scheme explains observed close link of sulfide mineralization of the magmatic type and the different forms of carbon. E.g., in sulfide ores of Kamchatka abundant pure CO<sub>2</sub> and CH<sub>4</sub>-rich bubbles in magmatic Opx were reported (Konnikov and Vasyukova, 2002). It is essential that at the pressure decrease from 8 to 2 kbar (shallow crustal depth) at fO<sub>2</sub> around NNO fluid composition is shifted to SO<sub>2</sub>-CO<sub>2</sub> mixture. Pressure of ca 7-8 kbar and fO<sub>2</sub> around QFM for sulfide bearing xenoliths from Avacha and Shiveluch (Kamchatka) volcanoes have been evaluated with novel amphibole (Simakin et al, 2011) and conventional two-pyroxene mineral sensors. In the similar conditions of COS stability magmatic sulfide ores of the Central Kamchatka collision zone have been formed. COS based fluid may be an agent of Ni enrichment of Opx and Ol reported in (Ishimaru and Arai, 2008). *Authors thank financial support from RFBR grants # 09-05-00313.*

### **References.**

S. Ishimaru and S. Arai, *Contrib Mineral Petrol* (2008) 156:119–131. E.G. Konnikov and O.N. Vasyukova, *Geology of Ore Deposits* (2007) 49: 227–237. A.G. Simakin et al., *Petrology* (2011) in press.