

# The system Fe-Ni-C-S at transition zone pressures and temperatures

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Oxygen fugacity ( $fO_2$ ) in the Earth's mantle decreases with increasing pressure as recorded by xenoliths from the cratonic lithosphere [1] [2]. Experimental studies suggest that this general trend continues in the asthenosphere, where  $fO_2$  levels below the iron-wustite reference might be achieved at upper mantle pressures [3] [4]. The saturation of Earth's mantle in an iron-nickel metal phase implies that siderophile elements are partitioned into the alloy. However, as siderophile elements like carbon and sulphur are present in high concentrations relative to the amount of Fe-Ni metal, discrete reduced phases like carbides ( $(Fe,Ni)_3C$ ,  $(Fe,Ni)_7C_3$ ) and/or sulphides might be stable in the deep mantle.

Recent studies in Fe-Ni-C (10 GPa) [5] and Fe-Ni-C-S (6-8 GPa) [6] systems suggest that accessory reduced assemblages are potentially molten in the deep mantle at adiabatic temperatures. Additionally, high sulphur concentrations in those melts limit the carbon solubility such that diamond becomes a coexisting phase [6]. At higher pressures, the amount of Fe-Ni metal is considered to increase and consequently Fe/Ni, metal/C and metal/S ratios are supposed to increase with pressure, too. To evaluate the effects of pressure and changing composition of the reduced species on phase relations, melting temperatures, element partitioning and partial melt mobility in the lowermost upper mantle and the transition zone, we investigate experimentally Fe-Ni-C-S in a silicate mineral matrix at 10-20 GPa and adiabatic temperatures. The results and implications derived from experimental runs will be presented and discussed at the meeting.

[1] Woodland & Koch (2003), *EPSL* **214**, 295-310. [2] Stagno *et al* (2013). *Nature* **493**, 84-88. [3] Rohrbach *et al* (2007), *Nature* **449**, 456-458. [4] Rohrbach *et al* (2011), *J. Petrol.* **52**, 717-731. [5] Rohrbach *et al* (2014) *EPSL* **388**, 211-221. [6] Tsuno & Dasgupta (2015) *EPSL* **412**, 132-142.