Nitrogen solubility in a molten assemblage of an (Fe,Ni) alloy and a CI chondritic silicate up to 18 GPa

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Nitrogen is the dominant gas in the Earth's atmosphere. Its concentration and its isotopic composition are used to constrain the formation of the atmosphere and the degassing of the planet's interior. Nevertheless, its distribution within the mantle and the core are poorly known, debated and controversial. Nitrides are stable in mantle conditions but the easy formation of nitrogen-metal alloys makes the core a reasonable candidate for nitrogen reservoir as well.

There are a limited experimental data on solubility of nitrogen in silicate melts. These data mainly point out effects of oxygen fugacity and pressure [1, 2]. To our knowledge, there are no data on nitrogen solubility in molten alloys at pressures higher than 25 bar. In this study, we used diamond anvil cells to collect data in the pressure and temperature range of the silicate Earth's interior. We report the solubility behavior of nitrogen in an assemblage of molten silicate of simplified CI chondrite composition and Ni-Fe alloys up to 18 GPa.

The solubility of nitrogen varies from 0.035 to 18 Wt% in the alloy and from a few ppm to 1-2 Wt% in the silicate when pressure increases from 1 bar to 18 GPa at about 2500-3000 K. Beside, we found that the higher the Ni-content of the alloy the lower the N_2 solubility. These data are used to evaluate the validity of the different solubility models originally developed for noble gas in silicate melts at high pressure and for nitrogen in metal alloys at low pressure.

[1] Roskosz *et al.* (2006) *GCA* **70**, 2902–2918. [2] Mysen B.O. *et al.* (2008) *Am. Min.* **93**, 1760–1770.

Gas deasphalting process at the fluid inclusion scale

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Fluid inclusions that trap oil may have attributes that reveal interaction with gas. Single oil inclusion analysis using Synchrotron FT-IR and UV-Visible spectroscopy have been used to characterise oils in fluid inclusions.

Fractures in a fractured crystalline reservoir often contain one or more oil inclusions that collectively constitute oil inclusion assemblages (OIAs). Fluorescence colour and size of the gas bubble are two of eight attributes assigned to OIAs from two wells from a petroleum field located in South-East Asia. Oil and gas condensate are accumulated in an unusal fractured granite basement reservoir.

Samples from wells A and B have been analysed where high fluid inclusion abundance has been measured. Samples from the oil zone (Well A) contain one OIA with uniform near-white fluorescing oil around a medium size bubble and a second OIA with variant fluorescent colours in the near-yellow colour field around a small size bubble. Samples from the gas condensate zone (Well B) contain OIAs with variant fluorescent colours from near-blue to near-yellow with a covariance of the vapour phase size. Near-blue colour is associated with large vapour phase while near-yellow fluorescing oil inclusions contain a small vapour phase. Solid phases are often contain in oil inclusions and are more abundant in near-yellow and near-blue fluorescing inclusions. Methane quantification in oil inclusions using synchrotron FT-IR revealed a corelation between fluorescence colour of the oil, vapour phase size and methane content. Furthermore, mapping of the FT-IR signal of single oil inclusions revealed variations in the CH_2/CH_3 ratios associated with the presence of brownish solids on the inclusion walls. The uniform near-white fluorescing oil inclusions contain few solid particules and are interpreted as the initial oil in the reservoir. Gas enrichement in the reservoir induced a gas deasphalting process that produced solid phases that are found in the near-blue fluorescing methane-rich inclusions and in the near-yellow methane-poor inclusions. Methane-rich near-blue fluorescing oil accumulated in the gas condensate zone and are absent as fluid inclusions in the oil zone.