Institut de Minéralogie et de Physique des Milieux Condensés
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SÉMINAIRE
Lundi 11 janvier, 10h30

Salle de conférence, 2ème Etage, Bâtiment 10
Campus Boucicaut, 140 rue de Lourmel, 75015 Paris

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VOLATILES IN EARTH´S MANTLE

I will review some new experimental data on the behavior of water, carbon dioxide and noble gases in Earth´s mantle. The water solubility in upper mantle minerals was believed to be low compared to transition zone minerals. Recent experiments have shown that pyroxenes under very low pressure can incorporate nearly one weight percent of water. This produces a minimum in water solubility in the upper mantle that precisely coincides with the seismic low velocity zone. I therefore suggest that at this depth, not all water can be stored in minerals anymore; the excess water forms a partial melt. Partial melting in the asthenosphere is consistent with the observed anisotropy of electrical conductivity.
Unlike water, carbon is almost completely insoluble in mantle minerals and therefore forms a separate carbonate phase. CO2 has a major effect on the melting point of mantle peridotite, but the mechanism of dissolution of CO2 in silicate melts is not well understood. I show new synchrotron infrared absorbance spectra obtained from silicate melt directly at high pressure and high temperature. The data show that at typical magmatic temperatures, molecular CO2 dominates in the melts over carbonate.
Noble gases are generally believed to be extremely incompatible in mantle minerals. I show new experimental results that demonstrate that argon is highly soluble in perovskite, the main constituent of the lower mantle, with solubilities approaching 1 wt. percent. Xenon solubility, on the other hand, appears to be negligible. These data suggest some obvious solution for the Earth´s "missing xenon".

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