

## W0065

**Reactivity of Xe with Silica at High Pressures and Temperatures.** C. Sanloup<sup>1</sup>, B. Schmidt<sup>2</sup>, E. Chamorro Perez<sup>3</sup>, A. Jambon<sup>1</sup>, E. Gregoryanz<sup>4</sup>, M. Mezouar<sup>5</sup>, <sup>1</sup>Univ. Pierre et Marie Curie-Paris6, France, <sup>2</sup>Goettingen Univ., Germany, <sup>3</sup>CSEC, Univ. of Edinburgh, UK, <sup>4</sup>ESRF, Grenoble, France.

The rare gases are widely used as geochemical tracers assuming they are volatile and chemically inert. Xenon isotopes are used to date the formation of the atmosphere, and the age of the Earth. Argon isotopes are used as tracers of mantle mixing/dynamics. However, normally inert rare gases have shown to be not that inert starting in 1962, with the synthesis of xenon salts (1). The chemistry of Xe now extends to O, C, N, S, and halogens (2). Several Kr compounds are known (3), few Ar compounds have also been synthesized and bonding with C and Si is predicted (4).

We show that at high temperatures and pressures, the normally unreactive xenon can bond covalently with oxygen in quartz (5), displacing silicon atoms in the crystal lattice. This suggests that xenon could exist in stores of quartz that lie deep inside the Earth's crust, a possibility that would normally escape notice because xenon diffuses out almost immediately at surface conditions. This result provides an answer to the long standing "missing Xe" problem, *i.e.* the deficiency of the atmosphere in xenon compared to other rare gases. This result also opens the way to rare gases chemistry.

(1) Bartlett, Proc. Chem. Soc., 27, 218, 1962. (2) Petterson et al., Eur. J. Inorg. Chem., 505, 729, 1999. (3) Khriachtchev, J. Am. Chem. Soc., 125, 6876, 2003. (4) Cohen et al., J. Chem. Physics, 119, 6415, 2003. (5) Sanloup et al., Science, 310, 1174, 2005.