ESRF	**Experiment title:** ImPACT: Impose Pressure and Change Technology	**Experiment number**: HC-790
Beamline: BM01a	**Date of experiment**: from: 06 giu 2013 to: 09 giu 2013	**Date of report**: 17/01/2015
Shifts: 12	**Local contact(s)**: Vladimir Dmitriev	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Rossella Arletti Dipartimento di Scienze della Terra, Università di Torino, Italy

Simona Quartieri Dipartimento di Fisica e Scienze della Terra, Università di Messina, Italy

Giovanna Vezzalini Dipartimento di Scienze Chimiche e Geologiche, Università di Modena e Reggio Emilia, Italy

Lara Gigli Dipartimento di Scienze della Terra, Università di Torino, Italy

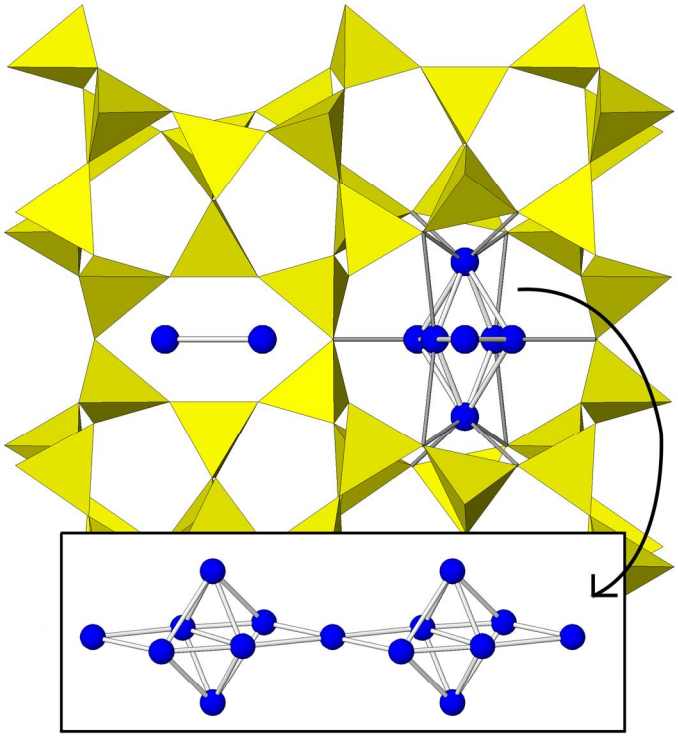
Lara Leardini Dipartimento di Fisica e Scienze della Terra, Università di Messina, Italy

Report:

The response to pressure of a natural ferrierite from Monastir (Sardinia, Italy) (Mon-FER) and of the synthetic all-silica phase (Si-FER) was investigated by means of in situ synchrotron X-ray powder diffraction in the presence of penetrating (methanol:ethanol:water 16:3:1, m.e.w.) and non-penetrating (silicone oil, s.o.) pressure transmitting media (PTM). The following aspects are discussed: (i) the penetration of extra- H2O molecules into the all-silica phase and the related structural aspects involving both framework and extraframework systems; (ii) the influence of the zeolite composition and of the different PTM used in the compression experiments on the overall elastic parameters of the two investigated samples; (iii) the elastic parameters and the unit cell P-induced deformations of the mineral phase; (iv) the reversibility extents of the observed phenomena. Evidence of H2O molecules penetration during compression of Si- FER in m.e.w. was found. The refinement performed at 0.2 GPa enabled location of 15 H2O molecules forming bulk-like and monodimensional H2O clusters. No methanol or ethanol penetration was observed.

The results demonstrate that the free volume of the porous material is not the only parameter influencing water condensation since applied pressure is an additional fundamental factor. The bulk modulus value calculated from Pamb to 4.9 GPa for Mon-FER (K0 = 44 GPa, Kp = 0.2) is intermediate between the lowest (about 14 GPa) and the highest (about 72 GPa) values determined to date for zeolites compressed in non-penetrating PTM. The highest P-induced deformations are observed for Si-FER compressed in s.o. In general, higher rigidity for the natural sample was found in both media.

Water molecules intruded in Si-FER compressed in m.e.w.



Full details of the results in:
Arletti R., Vezzalini, G, Quartieri, S. (2014) Pressure-induced water intrusion in FER-type zeolites and influence of the extraframework species on the structural deformations, Microporous and Mesoporous 191, 27-37.