

BH_4^- groups ordered in a superstructure. δ' - $\text{Mn}(\text{BH}_4)_2$ is not isostructural to the second high-pressure phase of $\text{Mg}(\text{BH}_4)_2$. Equations of state were determined for α - and δ - $\text{Mn}(\text{BH}_4)_2$

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MS17-P14 In situ X-ray crystallography of colloidal crystals under sintering conditions

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Periodic photonic nanostructures enable to manipulate and control light emission and propagation due to existence of band gaps [1, 2]. Photonic crystals represent a new class of nanomaterials with promising applications in optical communication lines, sensor technology and data storage. Colloidal crystals formed by self-assembly of sub-micrometer colloidal spherical particles [3] are especially attractive due to their large area, low fabrication costs and a wide range of particle size and shape. Investigation of a real structure of these materials and its temperature dependence is of utmost importance for the future development of photonic devices.

Band gap properties of colloidal crystals can be altered by thermal treatment (dry sintering) [4]. The physical reason for this phenomenon is not well understood. The behavior of low-order spin-coated polystyrene (PS) colloidal films under annealing treatment provides only rough picture of structural evolution [5]. Our recent studies of high-quality PS colloidal crystals upon incremental heating conditions have revealed detailed scenario of colloidal crystal melting [6, 7]. X-ray diffraction studies of PS colloidal crystals have been carried out in transmission and reflection geometries using high resolution X-ray scattering setup at the Coherence Beamline P10 of the PETRA III light source. Diffraction peak parameters, such as q-values, integrated peak intensities, the radial and azimuthal widths, were analyzed as a function of temperature [7]. Temperature dependencies of lattice distortions, mosaic spread and a size of coherently scattering domain were evaluated by Williamson-Hall method. As a result we identified four stages of structural evolution in PS crystals upon sintering: steady-state, pre-melting, shape transformation and crystal melting. The observed peculiarities of lattice distortions indicate that the evolution of in-plane and out-of-plane order plays a central role in the process of colloidal crystal melting.

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MS17-P15 How do zeolite capture CO₂? in-situ synchrotron XRPD investigation of gas adsorption in FAU systems

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The separation of CO₂ from other light gases has been largely practiced in the past. In particular, much of the work concerned the separation of CO₂ for the purification of natural gas¹. More recently, great emphasis has been given to CO₂ separation from the flue gases associated with combustion processes^{2,3}. This interest is directly linked to the importance of CO₂ as a key anthropogenic greenhouse gas, strictly linked to global climate changes⁴. In this work we describe the positions and the interactions of the CO₂ molecules adsorbed in zeolite cavities, on the basis of *in situ* synchrotron X-Ray Powder Diffraction (XRPD) experiments performed at the MCX beamline at Elettra Sincrotrone Trieste source. Three different zeolite samples were investigated: NaX, NaY and CaLSX. They share the same FAU framework type, but have different Si/Al ratios and cation contents. After a HT treatment, carried out to remove the water molecules hosted in the channels, the samples were saturated with CO₂ at 1 bar for 30 minutes and XRPD patterns were collected on an image plate at a fixed wavelength. In order to study the CO₂ desorption behavior, a series of patterns was collected upon heating from room T to 600°C. The experiments show that CO₂ was successfully adsorbed in the zeolite channels of all the samples. Forty-eight and forty CO₂ molecules were localized in Na-Y and Ca-LSX supercage, respectively. In the sodic sample the molecules-cation interactions are water mediated, while in the Ca phase the CO₂ molecules directly interact with the cation sited in the supercage. In the Na-X sample five Na-coordinated CO₂ molecules were localized in the sodalitic cage, while carbonate-like species were found near the supercage. Due to the low number of CO₂ molecules found by this structure refinement, we can not exclude that further molecules are present in the cages with a disordered distribution. Upon heating up to 600°C, NaX and NaY underwent a complete release of all the previously adsorbed CO₂ molecules. On the contrary, Ca-LSX retained 25 CO₂ molecules, suggesting a stronger bonding interaction with Ca cations in the channels.

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