Metastable disordered phase in flash-frozen Prussian Blue Analogues

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Prussian Blue Analogues (PBAs) are transition metal cyanides, widely investigated due to their catalytic and optical activity, ability to transport and store ions and small gas molecules. The later property is allowed by the presence of the large number of structural hexacyanometallate vacancies, which connect to form a porous network. These vacancies are filled with water: coordinated water molecules, which replace missing cyanide groups, and zeolitic water in the spherical cavities.

In this work we report a novel diffuse scattering signal, appearing after fast freezing of the PBA crystals. This signal emerges in the form of diffuse "clouds" around the Bragg peaks, which grow in intensity at higher Q, and are caused by the corrugation of the atomic lattice. We hypothesize that this corrugation is the response of the PBA lattice to the stress developed by water freezing in the nanopores. Furthermore, we discuss the effect of freezing on mechanical properties of Mn[Co] PBA.

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