

SEMINARIO

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High Pressure/High Temperature synthesis of novel functional double perovskites and related structural, magnetic and electric characterization

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High Pressure/High Temperature (HP/HT) solid-state reactions constitute an effective synthesis method to metastabilize novel compounds in the field of fundamental material science. These materials are usually characterized by unusual oxidation states and coordination numbers for cations, which lead to rare crystallographic symmetries. The extreme conditions of HP/HT synthesis force strong structural distortions, which interplay with very exotic physical properties such as the coexistence of magnetism and ferroelectricity in the so-called multiferroic materials. Namely, distorted double perovskites (AB₂B'O₆) can solely be stabilized by HP/HT solid-state reaction. Their extraordinary density and tolerance factor allow us to explore a wide spectrum of chemical substitutions on both A and B sites. Particularly, through a proper choice of cationic substitutes, it is possible to merge and control multiple and, in some cases, complementary functionalities in a single phase.

Herein, the newborn Bi₂CuMnO₆ and KPbFeMoO₆ double perovskites from the HP/HT laboratory of IMEM-CNR will be presented as the main characters of my PhD thesis. Particularly, the seminar will cover all the aspects of how to characterize this kind of novel material, starting from the optimization of the synthesis conditions, with the consequent solution for the crystal structure, which usually requires a combined approach of complementary techniques, like X-ray, neutron, or electron diffraction. Moreover, the physical properties of these materials, with particular attention on the magnetic and electric point of view, will be discussed, with a deep comparison with similar double perovskites.