Poster Presentation

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HP/HT synthesis and characterization of novel multiferroic Bi-based perovskites

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Bi-based perovskites (BiM1-xM'xO3, where M e M' are 3d and 4d metal ions) are considered very promising candidates to show multiferroic magnetoelectric character. A multiferroic magnetoelectric is a material in which ferromagnetism and ferroelectricity are not only coexistent but also coupled. Such properties, very rare in natural materials, are suitable for electronics, data storage and spintronics applications. Therefore, the interest in this class of compound showed an increasing trend of scientific publications in the last ten years. Unfortunately most members of this family cannot be synthesized with conventional techniques, due to their highly unstable and distorted crystallographic structure. High isostatic pressures and high temperatures can be exploited to overcome this fundamental drawback. The strategy is to induce ferroelectricity (e.g. polar symmetry) achieving the stereochemical effect of Bi3+ 6s2 lone pair, that polarizes the bonds with the neighboring oxygen anions, and independently to bring magnetism through the introduction of magnetic ions of the third or the fourth period on the octahedral coordinated B-site of the perovskite structure. We have synthesized simple and complex (quadruple [1,2] and double [3]) Bi-based perovskites in wide ranges of pressure (from 3 to 9 GPa) and temperature (from 900°C to 1650°C) by means of solid state reactions in a multi-anvil Walker-type Press. We present an accurate study of the structural, magnetic and electric properties. Furthermore, unconventional home-made set-ups are also presented as the tools to probe the coupling between the electric and the magnetic properties through crossed magnetic characterizations (magnetic susceptibility dependence on an applied electric field) and reversely crossed electric characterizations (polarization as a function of an external magnetic field).

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