Magnetic and transport properties along with local distortions in $Bi_2Mn_4O_{10}$ and $Bi_2Fe_4O_9$ multiferroic compounds

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We have performed a comprehensive study on the magnetic and electrical properties through macroscopic and local characterizations on $Bi_2Mn_4O_{10}$ and $Bi_2Fe_4O_9$. An analysis of the temperature evolution of local distortions, which was obtained by perturbed angular correlation measurements, revealed an anomalous behavior of the quadrupolar frequency and asymmetry parameter below the antiferromagnetic ordering temperature for both samples. The combined results suggest correlations between magnetic, electric, and elastic interactions. At high temperature, we have observed that the hopping frequency and activation energy in the electrical transport mechanism are close related to hyperfine parameters, electrical field gradient and asymmetry parameter, due to modifications in the equilibrium positions of oxygen atoms conforming octahedral, pyramidal, and tetrahedral environments. Anharmonic lattice effects are much more pronounced in a temperature range close to room temperature.

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