Contribution ID: **119** Type: **Poster Presentation**

Domain Wall Structure and Electric Polarization in BiFeO₃

Tuesday, 12 July 2016 16:30 (1 hour)

Abstract content
   (Max 300 words)
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BiFeO₃ is a well-studied multiferroic material with distorted perovskite structure where electric polarization P parallel to [111] and cycloidal spin order with the propagation vector Q perpendicular to [111] directions (3-fold degenerate). Recently, an additional electric polarization P' acommpanied by Q has been observed, which is proposed to be applied to a 3-state memory devices. We study a model which includes spin interactions and anisotropies to represent the magnetism of BiFeO₃, and analyzed the model using Monte Carlo as well as LLG methods. The model reproduces magnetization curves as well as electric polarizations as a function of magnetic fields (cross-correlation curves). Spurious polarizations created by domain wall structures are also observed, which explains exotic featrues of the cross-correlation curves observed in BiFeO₃.

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Session Classification: Poster Session