Surface magnetization of a multiferroic with linear M-to-P coupling: The case of FeTiO$_3$

JAMES GLASBRENNER, KIRILL BE-LASHCHENKO, University of Nebraska-Lincoln — A multiferroic material with linear coupling between the magnetization $M$ and electric polarization $P$ could serve as an electric switch of magnetization. However, for applications it is necessary to couple its magnetization to a proximate ferromagnet through exchange bias at the interface. Symmetry considerations indicate that multiferroics with linear M-to-P coupling should also have a boundary magnetization, which is not directly coupled to $P$ but is rather determined by the surface normal direction. This magnetization can present an obstacle for electric switching of exchange bias. Here we investigate the (001) surface magnetization of LiNbO$_3$-type FeTiO$_3$ using first-principles PAW calculations with spin-orbit coupling. The surface magnetization appears through spin canting of the surface moments. This canting is found for different surface terminations and compared with the bulk behavior.

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