Abstract Submitted
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Electric-field-induced modification in magnetocrystalline anisotropy, exchange interaction, and Curie temperature of transition-metal thin films[1] K. NAKAMURA, M. OBA, T. AKIYAMA, T. ITO, Mie University, M. WEINERT, University of Wisconsin - Milwaukee, A.J. FREEMAN, Northwestern University — Magnetism induced by an external electric field (E-field) has received much attention as a potential approach for controlling magnetism at the nano-scale with the promise of ultra-low energy power consumption. For magnetocrystalline anisotropy (MCA) in transition-metal thin films, it is agreed that a change in the screening charge density due to an E-field, which causes a small change in band structures around Fermi energy, gives rise to a modification of the MCA energy.[2] Here, we extend our first-principles investigation to Curie temperature of an Fe monolayer in an E-field. Calculations were carried out using film-FLAPW method that treats spin-spiral structures in an E-field. Results predict that when the E-field is introduced, calculated magnon (spin-spiral formation) energy is modified, by a few tens of meV, compared to that in zero field. The exchange parameters within the classical Heisenberg model, by making the back Fourier transformation of the magnon energy, suggest the E-field-induced modification of Curie temperature. Taking a large MCA energy of the monolayer into account, the modification of Curie temperature by the E-field was demonstrated by Monte Carlo simulations.

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[2]Nakamura et.al, PRL**102**, 187201(2009); PRB**81**, 220409(2010)

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