

Abstract Submitted  
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**First-principles study on magnetism of Ru monolayer under an external electric field** YUKIE KITAOKA, HIROSHI IMAMURA, AIST, Spintronics Research Center — Electric field control of magnetic properties such as magnetic moment and magnetic anisotropy has been attracted. For the  $4d$  TM films, on the other hand, it was recently reported that the ferromagnetism Pd thin-film is induced by application of an external electric field otherwise Pd thin-film shows paramagnetic [1]. However, little attention has been paid to the magnetism of other  $4d$  TMs. Here, we investigate the magnetism of the free-standing Ru monolayer and that on MgO(001) substrate under an external electric field by using first-principles FLAPW method [2]. We found that the free-standing Ru monolayer is ferromagnet with magnetic moment of  $1.50 \mu_B/\text{atom}$ . The MA energy is  $3.45 \text{ meV}/\text{atom}$ , indicating perpendicular MA, at zero electric field ( $E=0$ ) and increases up to  $3.84 \text{ meV}/\text{atom}$  by application of  $E=1 \text{ (V/\AA)}$ . The Ru monolayer on MgO(001) substrate is also ferromagnet with magnetic moment of  $0.89 \mu_B/\text{atom}$ . The MA energy is  $1.49 \text{ meV}/\text{atom}$ , indicating perpendicular MA, at  $E=0$  and decreases to  $1.33 \text{ meV}/\text{atom}$  by application of  $E=1 \text{ (V/\AA)}$ . [1] Y. Sun, J. D. Burton, E. Y. Tsymlal, PRB 81, 064413 (2010). [2] K. Nakamura, T. Ito, A. J. Freeman, L. Zhong, J. Fernandez-de-Castro, PRB, 67, 014420 (2003).

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