



香港浸會大學

HONG KONG BAPTIST UNIVERSITY

FACULTY OF SCIENCE

Department of Physics & Institute of Computational and Theoretical Studies

JOINT COLLOQUIUM

Interface magnetism in Fe-Ti oxide films

By

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3:15pm – 4:15pm (Tea will be served)

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Abstract

Thin films of Fe-Ti oxides are of interest as magnetic semiconductors with high Curie temperature and with possible applications in spintronic devices, they are also discussed as photoanode for solar water splitting. The interface between hematite (Fe_2O_3 , weakly ferrimagnetic) and ilmenite (FeTiO_3 , antiferromagnetic) has been predicted to be strongly ferrimagnetic due to the formation of a mixed valence layer of $\text{Fe}^{2+}/\text{Fe}^{3+}$ caused by compensation of charge mismatch at the chemically abrupt boundary. The enhanced magnetism in hematite-ilmenite exsolution systems has been assumed to be the origin of magnetic anomalies in the earth crust. An experimental proof has not been given until now. Using molecular beam epitaxy, we have grown thin films of α - Fe_2O_3 on α - $\text{Al}_2\text{O}_3(0001)$ substrates with and without Ti content. The films were structurally characterized in-situ with surface X-ray diffraction, Raman spectroscopy and TEM images. Magnetization measurements were performed with a SQUID magnetometer. Comparison of samples of hematite layers with and without a thin Ti layer exhibit a significant increase of the remanent and saturation magnetization of the sample with Ti. Electron energy loss spectroscopy profiles across the $\text{Fe}_{2-x}\text{Ti}_x\text{O}_3/\text{Fe}_2\text{O}_3$ interface show that $\text{Fe}^{2+}/\text{Fe}^{3+}$ ratios peak right at the interface rather than assuming an intermediate value. This strongly supports the hypothesis of the interface magnetism in hematite-ilmenite systems.

All Interested Are Welcome!