PHYSICS SEMINAR SERIES

TOPIC: Understanding and Predicting Multiferroics

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VENUE: Room 202, Pudong Campus, NYU Shanghai
Broadcasting Room 375, Geography Building, Zhongbei Campus, ECNU

HOST: Hanghui Chen, NYU Shanghai

ABSTRACT OF THE TALK

Materials with a coexistence of magnetic and ferroelectric order — multiferroics — provide an efficient route for the control of magnetism by electric fields. In recent years, we proposed a unified model [1,2] which includes purely electronic and ion-displacement contribution simultaneously to describe spin-order induced ferroelectricity. On the basis of the unified model and density functional calculations, we explained the ferroelectricity induced by the proper-screw spin spiral [1], discovered a novel magnetoelectric coupling mechanism in which the magnitude of the polarization is governed by the exchange striction with the direction by the spin chirality [3], proposed that the ferroelectricity in the chiral-lattice magnet Cu2OSeO3 is due to the unusual single-spin site term [4].

Currently, the available single-phase multiferroics are not suitable for realistic applications. We predicted that hexaferrite BaFe12O19 may be the first example of multiferroic materials that displays antiferroelectricity [5]. The antiferroelectricity in this system is “geometrically frustrated” by the underlying hexagonal structure. Moreover, we predict that double perovskite Zn2FeOsO6 is a new multiferroic with properties superior to BiFeO3. First, there are strong ferroelectricity and strong ferrimagnetism at room temperature in Zn2FeOsO6. Second, the easy-plane of the spontaneous magnetization can be switched by an external electric field, evidencing the strong magnetoelectric coupling existing in this system [6]. Finally, we predict that two dimensional P2O3 is a thinnest hyperferroelectric [7].

References:

**BIOGRAPHY OF THE SPEAKER**

Hongjun Xiang received his Bachelor degree and Ph.D. in chemical physics from the University of Science and Technology of China in 2001 and 2006, respectively. He worked on magnetic systems at North Carolina State University from September 2006 to August 2007. After that, he moved to the National Renewable Energy Laboratory where he performed research on energy related materials for about two years. Since October 2009, Hongjun Xiang has been a Professor of Physics at Fudan University. He is now supported by the National Youth Talent Support Program (Qing Nian Ba Jian). His current research focus is on theoretical studies of ferroelectrics, magnets, multiferroics, and two-dimensional materials.