

SEMINARIUM Z MAGNETYZMU I NADPRZEWODNICTWA

Uprzejmie zawiadamiamy, że w **środe**

16 października 2019 r., o godz.10:00

w sali 203 (bud. 1) odbędzie się seminarium, na którym

Prof. dr hab. Bogdan Dąbrowski

Instytut Fizyki PAN, Warszawa

wyłosi referat na temat:

„Mn-ion based perovskite multiferroics”

Multiferroics exhibiting simultaneous ferroelectric (FE) and magnetic orderings are a topic of intense investigations due to potential breakthrough applications in spin-based electronics. Single-phase and single-ion multiferroics are extremely rare because of apparently mutually exclusive requirements: presence of the d^n electrons for magnetism and the empty d^0 shells for FE. We have studied FE and multiferroic phases present in the $Sr_{1-x}Ba_xMn_{1-y}Ti_yO_3$ perovskite system. We have proven the relation between the FE T_C and the simple structural parameter, the tolerance factor $t = [A-O]/2^{1/2}[Ti-O] > 1$, by substituting smaller M = Mn and Ge for Ti, which increase t and T_C . This result supported our conjecture that the major parameter responsible for the development of displacive FE transition is the tension exerted on the perovskite M-O bonds. Similar tolerance factor, $t > 1$ is expected for the cubic antiferromagnetic ($T_N = 234$ K) $SrMnO_3$ for which the Mn-O bonds are also under tension which increases with the substitution of a larger Ba for Sr. By using the two-step synthesis procedure to stabilize the perovskite $Sr_{1-x}Ba_xMnO_3$ materials we have indeed found new multiferroics for $x \geq 0.43$, which exhibit both antiferromagnetism (d^3) and robust FE distortions originating exclusively from the Mn and oxygen displacements. Typical, displacive-type FE phase with a polarization of dozens $\mu C/cm^2$ as determined from the measured distortions occurs when the Mn ions move out of the center of the MnO_6 octahedral units at $T_C \sim 350$ K. The Mn spins order below $T_N \sim 210$ K into a G-type magnetic structure which causes suppression of the FE distortions. We have recently extended our investigation to the Ti-substituted system for which the displacive distortions significantly exceed the size of distortions in FE $BaTiO_3$, and the T_C was increased up to 420 K. The T_N decreased to below 200 K and the suppression of the FE distortion below T_N was reduced i.e., we have achieved single-ion multiferroic with large spontaneous polarization.

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Serdecznie zapraszamy

Roman Puźniak / Henryk Szymczak / Andrzej Szewczyk