Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Unveiling hidden ferrimagnetism and giant magnetoelectricity in polar magnet $Fe_2Mo_3O_8$ YAZHONG WANG, GHEORGHE L. PASCUT, BIN GAO, RCEM, Rutgers Univ, TREVOR A. TYSON, New Jersey Institute of Technology, KRISTJAN HAULE, VALERY KIRYUKHIN, SANG-WOOK CHEONG, RCEM, Rutgers Univ, RUTGERS CENTER FOR EMERGENT MATERIALS TEAM, DEPARTMENT OF PHYSICS, NEW JERSEY INSTITUTE OF TECHNOLOGY COLLABORATION — Polar magnets, belonging to the polar crystallographic symmetry groups and containing magnetic ions, can exhibit non-trivial magnetoelectric (ME) effects below magnetic ordering temperatures due to the broken time reversal and space inversion symmetries. Mono-domain polar single crystals can often be grown, and eliminate the need for any poling procedures to reveal the possible ME response. Here, we report a giant ME effect in a polar magnet $Fe_2Mo_3O_8$ at temperature as high as 60 K. Polarization jumps of 0.3 $\mu C/cm^2$ and repeated mutual control of ferroelectric and magnetic moments with differential ME coefficients on the order of 10^4 ps/m are achieved. The sign of the ME coefficients can be switched by changing the direction of the applied "bias" magnetic field. Importantly, no electric or magnetic poling is needed, as necessary for applications. Using first principles calculations, we show that exchange striction is the leading mechanism responsible for the observed ME effect.

Yazhong Wang
RCEM, Rutgers Univ

Date submitted: 24 Nov 2015 Electronic form version 1.4