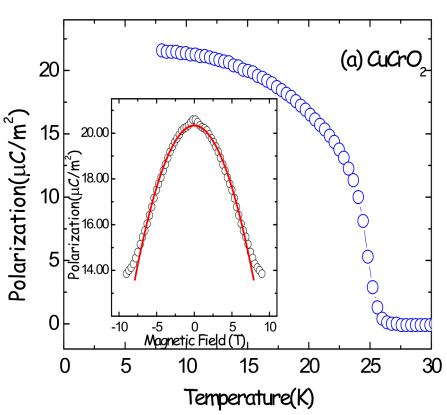
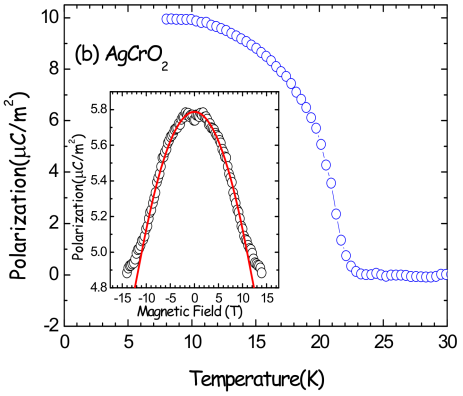
Magnetoelectric coupling in delafossite: $ACrO_2$

Kiran Singh, Charles Simon, Antoine Maignan and Christine Martin
Laboratoire CRISMAT, CNRS UMR 6508, ENSICAEN, 6 Bd. du Maréchal Juin, 14050 Caen Cedex, France

Oxide materials are the most fascinating and exciting class of materials because most of the interesting phenomena have been observed in these materials: ferroelectricity, superconductivity, colossal magnetoresistance and multiferroicity. In multiferroics, triangular-lattice antiferromagnet (TLA) ABO_2 system has been studied extensively. A large number of ternary noble metal oxides crystallize as ABO_2 type delafossite structure [1,2]. $CuFeO_2$, $CuCrO_2$, and $AgCrO_2$ order antiferromagnetically and multiferroics at low temperature [3, 4,5,6,7]. In $CuFeO_2$ and $ACrO_2$ (Cu and Ag) the mechanism of ferroelectricity is different. $CuFeO_2$ shows ferroelectricity only in the presence of magnetic field (between 7 to 12T) in its noncollinear incommensurate phase. The different nonmagnetic substitution (Al, Ga and Rh) at Fe site dilutes the magnetic structure and exhibits ferroelectricity even in the absence of magnetic field [8, 9]. However, $ACrO_2$ (Cu and Ag) exhibits the ferroelectricity is observed in even in the absence of external magnetic field. In this talk I will discuss about the multiferroic properties and magnetoelectric coupling in $ACrO_2$ (Cu and Ag) polycrystalline samples.





1. W. Soller and A. J. Thompson, Phys. Rev. 47, 644 (1935).
2. R. D. Shannon. D. B. Rogers and C. T. Prewitt, Inorg. Chem. 10, 713 (1971).
3. T. Kimura, J.C. Lashley and A. P. Ramirez, Phys. Rev. B 73, 220401(R) (2006).
4. S. Seki, Y. Onose and Y. Tokura, Phys. Rev. Lett. 103, 067204 (2008).
5. M. Poienar, F. Damay, C. Martin, V. Hardy, A. Maignan and G. Andre, Phys. Rev. B 79, 014412 (2009).
6. A. Maignan, C. Martin, R. Frésard, V. Eyert, E. Guilmeau, S. Hébert, M. Poienar and D. Pelloquin, Sol. State Comm. 149, 962 (2009).
7. K. Singh, B. Kundys, M. Poienar and Ch. Simon, J Phys.:Condens. Matter 22, 445901 (2010).
8. B. Kundys, A. Maignan, D. Pelloquin and Ch. Simon, Solid State Sci. 11, 1035 (2009).
9. E. Pachoud, C. Martin, B. Kundys, Ch. Simon and A. Maignan, J. Solid State Chem. 183, 344 (2010).