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Observation of Electric Hysteresis in Polyoxometalate Including Dy(III)

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The search of multiferroic materials that are combining ferromagnetism with ferroelectricity and/or ferroelasticity have attracted much interest due to their potential in the design of novel magnetoelectric devices. On the other hand, the great attention is devoted to introduce additional functionality in single molecule magnets (SMM) where slow magnetic hysteresis and macroscopic quantum tunneling on the single molecular or ion unit [1]. Recently we succeeded in the study of principally new type of material based Preyssler-type polyoxometalates (POMs) that exhibit single molecule ferroelectric-like behavior induced by motions of Tb^{3+} ion in the polyoxometalate cage [2]. The aim of our further study is development and investigation of compounds showing both magnetic and electric hysteresises on the single molecule. Herein we report the results of our study of dielectric properties of another POM including Dy^{3+} ion that SMM nature was described previously by Cordona et al. [3].

POMs including Dy^{3+} (DyPOM) were synthesized according to the previously reported method [4]. Dielectric measurement of the DyPOM has not showed clear ferroelectric transition below 420 K. However, the frequency dispersion of imaginary part of the dielectric constant appears in the range of 200K-300K. These results allow us to suggest that DyPOM exhibits both magnetic- and ferroelectric-like behaviors on single molecular unit. Details of their structure and physical properties will be presented.

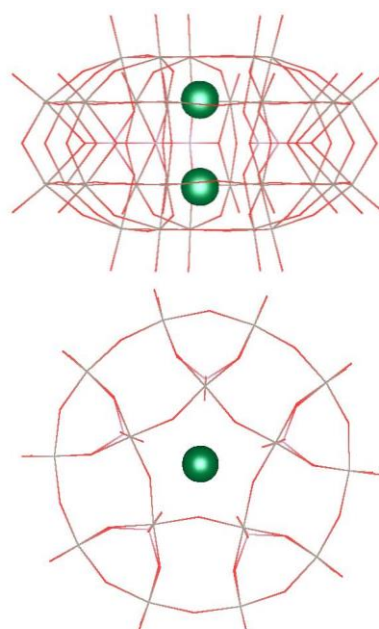


Figure 1. Preyssler-type POM (side and top views)

[1] R.Sessoli et. al., Nature., 365, 141-143 (1993)

[2] C.Kato et.al., to be submitted

[3] S.Cordona-Serra et. al., J. Am. Chem. Soc., 134, 14982-14490 (2012)

[4] I.Creaser et. al., Inorg. Chem, 32, 1573-1578 (1993)