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Magnetic field dependent ferroelectric like behavior in glass S. MUKHERJEE, C.H. CHEN, C.C. CHOU, H.D. YANG, B.K. CHAUDHURI[1], Department of Physics and Center for Nanoscience and Nanotechnology, National Sun Yat-Sen University, Kaohsiung, 804 — Lines first proposed the possibility of ferroelectricity (FE) in glass polar or nonpolar medium. However, so far no such material has been developed showing FE in glass. We developed some novel rare earth oxide ($\sim$0.4 mol%) : SiO_2 glasses which show FE like behavior (with FE loop and Curie Weiss behavior) around ambient temperature. The observed colossal dielectric constant depends on magnetic and electric fields. No signature of structure was detected by XRD. However, long time annealing ($\sim$700 °) small number of rare earth oxide nanoparticles ($\sim$3 nm) appear as observed from high resolution electron micrograph but here also no sigh of crystalline peak in the XRD micrographs. We believe this is the first report supporting the possibility of FE in glass as proposed by Lines with no long range order. The origin of this dielectric instability is considered to be due to the strong coupling of the magnetic spin with the ?dielectrically soft? local O-Si-O structural unit (configuration) which causes micro- stress and an anisotropic strain developed during glass network formation with magnetic impurity ions. The stress released by annealing the glass and hence destroys the FE feature. A model with glass network structure has also been proposed.

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