Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Electric Field Induced Stable Micro Rotor in Nematic Liquid Crystal Drops Constrained on Thin Cellulosic Fibers MARIA HELENA GODINHO, YONG GENG, PEDRO ALMEIDA, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, JOÃO FIGUEIRINHAS, IST - Technical University of Lisbon, EUGENE TERENTJEV, Cavendish Laboratory, University of Cambridge, FCT/UNL TEAM, FCT/UNL TEAM, IST TEAM, CAVENDISH LABORATORY TEAM — We directly visualize the response of nematic liquid crystal drops of toroidal topology constrained on thin fibers, suspended in air, to an AC applied electric field **E**. This new localized liquid crystal system can exhibit non-trivial point defects, which may become energetically unstable against expanding into ring disclinations depending on the fiber constraining geometries. The director anchoring tangential near the fiber surface and homeotropic at the air interface, making a hybrid shell distribution that in turn causes a ring of disclination line around the main axis of the fiber at the center of the droplet. Upon application of **E**, the disclination ring first expands and slightly moves along the fiber main axis, followed by the appearance of a stable "spherical particle" orbiting around the fiber at the center of the liquid crystal drop. The rotation speed of this particle was found to vary linearly with the applied voltage. This constrained liquid crystal geometry seems to meet the essential requirements in which soliton like particles can develop and exhibit stable orbiting in three dimensions upon application of an external electric field. This is another example of a soft energy transducer system which allows, at the micro scale, the transfer in a continuous way of electrical to mechanical energy.

Maria Helena Godinho
Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa

Date submitted: 02 Nov 2011 Electronic form version 1.4