Defect Formation in Grating Structures via the Flexoelectric Effect

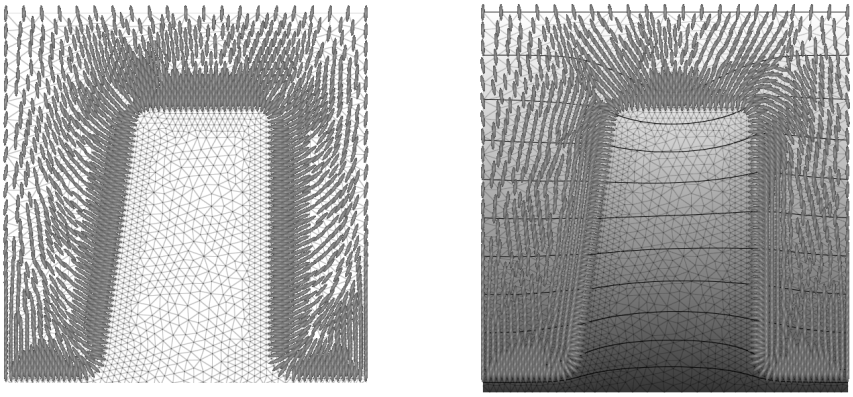
E. Willman, S. Ali, R. James, S. E. Day, F. A. Fernández

Department of Electronic & Electrical Engineering, University College London, Torrington Place, London WC1E 7JE, United Kingdom

It is well known that grating structures and ridges with homeotropic alignment exhibit zenithal bistability, supporting two distinct stable director configurations, one continuous (the C-state) and the other containing defects (the D-state), *e.g.* [1]. Switching between the two states relies on the flexoelectric effect and is possible by applying electric fields of opposing polarities.

Using a finite element discretisation of the Landau-de Gennes theory [2], we investigate the dynamics of defect formation and the complete switching process. The role of the flexoelectric coefficients on the formation of defect pairs and their subsequent separation is considered. This is studied for a number of geometries and a range of material parameters in two and three dimensions.

[1] C. Uche, S.J. Elston and L.A. Parry-Jones, *J. Phys. D.*, **2005**, 38, 2283-2291
[2] R. James, E. Willman, F.A. Fernández and S.E. Day, *IEEE Trans. on Electron Devices*, **2006**, *53*, 1575-1582



(a) *(b)*

Figure 1 A periodic asymmetric ridge structure. (a) Initial continuous state in the absence of applied electric fields. (b) An externally applied electric field in combination with the flexoelectric effect results in ±½ defect pair formation at the edges of the ridges.