Polymer stabilised ferroelectric liquid crystals studied by non linear dielectric spectroscopy

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Non linear dielectric spectroscopy consists to study the electrical response of a material under high electric field. In this case, the electric field and the electric displacement are no more in proportion. When the electric field is sinusoidal, the current and the electric displacement have to be analyzed as a sum of different harmonics. Hence, several non linear complex permittivities $\varepsilon^*_{m,n}$ are introduced where m and n represent the power of electric field and the order of the harmonic respectively. In previous work, we shown that several physical parameters (polarization, viscosity and elastic energy) of a ferroelectric liquid crystal (SmC* phase) can be obtained using measurements of $\boldsymbol{\varepsilon^*_{1,1}}$ and $\boldsymbol{\varepsilon^*_{3,3}}$ permittivities as well as a theoretical model [1,2]. Here, we present new non linear dielectric spectroscopy results obtained on a polymer stabilised ferroelectric liquid crystal cells (PSFLCs). Theses materials were obtained by a photopolymerisation process [3] of a reactive mesogenic monomer dissolved into a ferroelectric liquid crystal (FLC) media. The effects of the polymer network on the physical parameters of the ferroelectric liquid crystal are studied.

(1) Y. Kimura, S. Hara, R. Hayakawa, Ferroelectrics **245**, 61 (2000).
(2) J.M. Leblond, R. Douali, C. Legrand, R. Dabrowski, Eur. Phys. J. Appl. Phys. **36**, 157-163 (2006).
(3) M. Petit, A. Daoudi, M. Ismaili, J. M. Buisine, Eur. Phys. J. E, 20, 327 (2006).