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Structural transition and dynamic behavior of feronematic liquid crystal polarization grating under simultaneous magnetic and optical fields

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Abstract
The behavior of a liquid crystal polarization grating mixed with magnetic nanoparticles under magnetic and laser optical fields is investigated in the framework of the elastic continuum theory. The transition between the equilibrium and distorted states of the system is obtained for different volume fractions of nanoparticles under strong and weak anchoring conditions on the boundary surfaces. The phase diagram of the system indicates that higher threshold fields are required for the transition as the volume fraction of nanoparticles increases. Also, using the Ericksen–Leslie theory, the system's dynamic is investigated and the response times in the on and off states are calculated. The results reveal the effect of the presence of nanoparticles and the anchoring strength on the response times. These results are consistent with existing experimental reports and can be useful in many liquid crystal-based devices, including displays and beam- guiding devices.

Keywords: liquid crystal, ferromagnetic, polarization grating, magnetic nanoparticles, magnetic field

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