MONTE CARLO SIMULATION ON THE EFFECT OF ELECTRIC FIELD ON LIQUID CRYSTAL NEMATIC-ISOTROPIC PHASE TRANSITIONS

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ABSTRACT

Abstract

Monte Carlo simulations have been carried out to determine the effect of electric fields on the nematic-isotropic phase transition of liquid crystals. The change in phase transitions is known by the relationship between the order parameters and the energy interactions with temperature and the electric field. Simulation steps are carried out through physical modeling, mathematical modeling, numerical modeling and computer programming. The classic spin lattice model was chosen to describe the liquid crystal molecules in the system. The formulation of the interaction energy between spins used the Lebwohl-Lasher potential model. The Metropolis Monte Carlo technique is used to calculate the energy and order parameters of liquid crystals. The results showed that there was an effect of the electric field on the nematic-isotropic phase transition of liquid crystals. If the electric field strength is increased, the order parameter value will increase and the interaction energy value will be more negative, this means that the arrangement of the liquid crystal molecules becomes more orderly and stable so that high temperatures are required for the phase transition to occur. The increase in the electric field also results in the minimum value of the oder parameter above zero (S> 0), which means that the full isotropic phase is not achieved. In general, an increase in the electric field results in a higher transition temperature shift and induces the isotropic phase to become a paranematic phase.

Kata Kunci: *Key words: electric field, liquid crystal, nematic-isotropic phase transition*