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Advances in acoustics of liquid crystals

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Advances in the fundamental problem of the orientation transition in liquid crystals produced by acoustical action are considered. The theoretical models to describe a variety of liquid crystals orientation transitions in acoustic fields for the homeotropically and planar oriented layers which were developed in the framework of the Leslie-Ericksen hydrodynamics and the new methodology based on the ideas of non-equilibrium thermodynamics and nonlinear hydrodynamics are discussed and are substantiated experimentally. The orientation phenomena in liquid crystals were classified and the physical factors defining a kind of transition (threshold or non-threshold type) and a choice of approach correct to describe adequately the experimental data on a new molecular arrangement induced by acoustical action were established. Among them a macrostructure type of liquid crystals layer, a layer thickness-viscous wavelength in liquid crystal ratio, an angle between the medium optical axe (the liquid crystal director) and the line of acoustical wave propagation, a sound intensity, a type of acoustical boundary conditions at the layer edges. The modern ideas on the distortion peculiarities of liquid crystals above a certain threshold of the structure instability under non-stationary dynamic action on the liquid crystal layer of sound-induced oscillating flows for a wide frequency band were considered.