Edge Dislocation Effect in Thermal Properties of Smectic Liquid Crystal

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In the late 19th century, the Austrian chemist Friedrich Reinitzer found a new class of materials may provide states of matter between the isotropic liquid and the crystalline solid. In that state contains some intermediary phases including nematic, cholesteric and smectic phase, being the last one used on our work. In this work, we study some thermal properties of liquid crystal in smectic phase with the presence of topological defects, such as the edge dislocation defect. As these defects change the physical properties of the material, we simulated these properties to find new physics phenomena in the software. In order to do the simulation was necessary to write the thermal conductivity tensor under edge dislocation defect influence that could be obtained through the metric of defect [1]. We also needed to use some physical properties required in the software as density and heat capacity for a liquid crystal octylcyanobiphenyl (8CB) which can reproduce the smectic phase. We calculate the thermal properties with and without the presence of defect. Following the simulation we discovered that the defect presence decrease the thermal conductivity of material. In this way we can think about multiphysics devices made of smectic liquid crystal with edge dislocation to reduce the thermal transference.

Keywords: heat conduction, topological defect, thermal properties of smectic liquid crystal