Reunião Anual do INCT-FCx - 2022

De 26 a 29/Outubro de 2022,
Hotel Estância Atibainha, Nazaré Paulista/SP

Behavior of nonchiral and chiral active nematics confined to a nanoscopic ring

M.L. Lyra, E.J.L. de Oliveira, I.N. de Oliveira, L.V Mirantsev

Universidade Federal de Alagoas – Maceío/AL, Brazil
Russian Academy of Science – Saint. Petersburg, Russia

Abstract: We performed molecular dynamic simulations of model nonchiral and chiral active nematics confined to a two-dimensional nanoscopic ring-shaped region under both radial and tangential anchoring boundary conditions. These active nematics are composed of elongated particles which interact with each other by means of isotropic Lennard - Jones and anisotropic Maier-Saupe-like potentials. In addition, nonchiral particles have the terminal appendage emitting a jet of some substance generated by a certain internal chemical reaction, whereas chiral particles have analogous lateral one. As a result, nonchiral particles are exposed to an additional reactive self-propelled force directed along their long axes, and chiral particles are exposed to both the reactive self-propelled force and torque that provide not only an additional translational movement of particles but also a self-rotation with respect to their geometric centers. It is found that the nonchiral active nematics under consideration demonstrate an orientational order similar to that formed by passive (without the self-propelled force) ones within the same ring-shaped region. On the contrary, the chiral nematics demonstrate the orientational order significantly different from that demonstrated by passive ones. In addition, when the chirality of active nematic particles is sufficiently strong, the orientational order within the ring - shaped region undergoes substantial oscillations in time.

Key-words: Active matter, nematics, nanoscopic confinement
Support: This work has been supported by CAPES, CNPq, FINEP and FAPEAL
References:
[1] L. V. Mirantsev, Eur. Phys. J. E 44, 112 (2021)