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Structural properties in "distorted" discs liquid crystalline

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π-conjugated of the discotic liquid crystal material are promising candidates for numerous applications such as field-effect transistors, light-emitting diodes, photovoltaic devices, and have received extensive attention. Small perturbation in shape including extending core in one direction can have extensive impact on phase behavior, and may impact on electronic properties. It is worthwhile to mention, π-π interaction has a vital role to self assemble disc-shape molecules in to ordered columnar structure. As a result, any changes in the strength of the π-π interaction by changing the nature of substituent would likely affect the stacking interaction, and also to be able control of formation of the columnar phase mesophase. The main goal of this research was to create new type of discotic liquid crystals in order to study how small changes on disc shape molecules might impact on electronic properties and mesophase stability.

We designed new disc-shaped molecules based on dibenzo[a,c]phenazines which are obtained through modular syntheses. We carried out comprehensive studies for the optimization of the method by utilizing new methodology. These synthesis extended structure will be discussed, along with our efforts to rationalize the relationship between the nature of aryl substituent and the phase behaviour of molecules.

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Thermal rectification: Nanoscale pyramidal texturing of 100 silicon and growth carbon nanotubes to create an asymmetrical thermal energy pathway

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Raytheon along with the help of the University of Dayton Research Institute and University of Arizona is developing a nanoscale material that will conduct thermal energy at two different rates through the thickness from each direction thus producing a thermal rectifier

The design of the material is to begin with a 1 micron thick [100] silicon wafer, which is polished on one side. The unpolished side is etched with acid to produce a surface pyramidal shape. Aligned carbon nanotubes are then grown on the textured surface to create a highly conductive pathway for the phonon acoustic waves to travel through.

To date we have been able to simulate the thermal rectifier's feasibility with molecular modeling conducted with the assistance of Dr. Nick Swinteck of the sustainability engineering department at the University of Arizona. Molecular dynamics have been used to estimate this potential rectification efficiency. Growth and characterization of the aligned carbon nanotubes have been conducted with assistance from the Khalid Lafdi of the University of Dayton Research institute. Thermal testing of the material is to be conducted in the coming months and the data presented during the conference.

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