

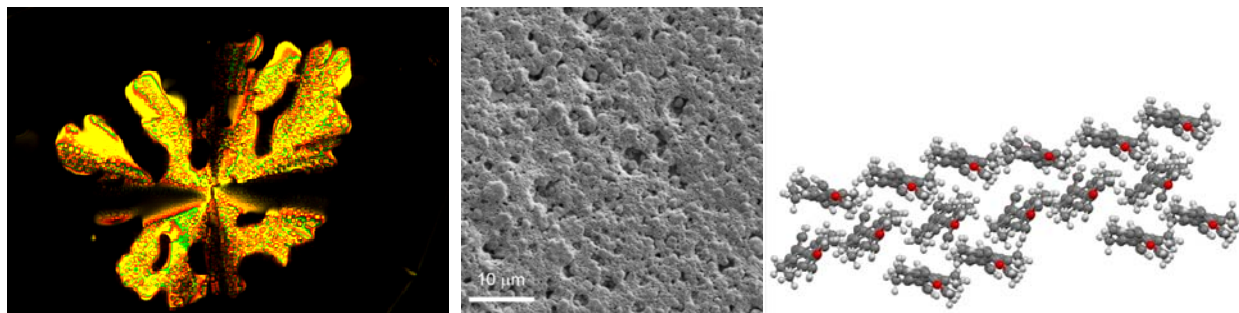
Preparation of Novel Discotic Liquid Crystals for Use in Organic Photovoltaics

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Abstract

In the near future, renewable energy sources are anticipated to be the key players in providing sustainable energy for the growing global energy demand and limited fossil energy resources. The increased interest in the use of organic charge-transport materials in organic photovoltaics (OPVs) stems from its potential for low-cost solar energy conversion. Our approach targets materials that self-assemble in the shape of columnar Discotic Liquid Crystals (DLCs). DLCs have been exploited in opto-electronic devices for their advantageous properties including long-range self-assembly, self-healing, ease of processing, solubility in a variety of organic solvents, and high charge-carrier mobilities along the stacking axis. We have successfully synthesized and characterized a series of *novel* discotic liquid crystals (DLCs) having a quinoxalinophenanthrophenazine (TQPP) core. Their synthesis, characterization, photophysical properties, and mesophase behavior are discussed. Furthermore, films formed of TQPP organic molecule combined with butylamine-modified graphene sheets (GSs) showed a photoelectrical response higher than those prepared with neat molecule and GSs/TQPP blend, respectively. In addition, we report the stacking of pyrene-based compounds as evidenced by X-ray structure analysis.



Publications

1. **Kaafarani, B. R.** “Discotic Liquid Crystals for Opto-Electronic Applications”, *Chem. Mater.* **2011**, *23*, 378-396.
2. Bittolo Bon, S.; Valentini, L.; Moustafa, R. M.; Jradi, F. M.; **Kaafarani, B. R.**; Verdejo, R.; Lopez-Manchado, M. A.; Kenny, J. M. “Morphology and Photoelectrical Properties of Solution Processable Butylamine Modified Graphene and Pyrene-based Organic Semiconductor”, *J. Phys. Chem. C* **2010**, *114*, 11252-11257.