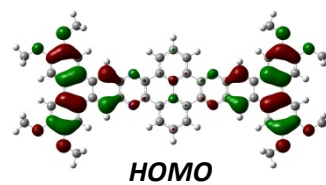
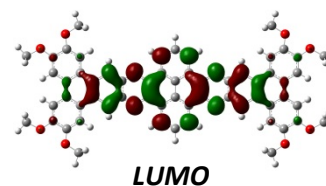


**Columnar Mesophases of Discotic Molecules as Organic Semiconductors**  
 Progress, Limitations, and New Directions  
 S. Holger Eichhorn

University of Windsor  
 thinking forward

Columnar mesophases of discotic molecules are an intriguing class of organic semiconductors because of their self-organizing and self-healing properties, high charge carrier mobility, and anisotropic charge transport (molecular wires). Much progress has been made in the control of specific properties by molecular design and key examples from our and other groups will be presented that govern phase transition temperatures, columnar mesomorphism, alignment on surfaces, frontier orbital energies, and charge conduction among other properties. Unfortunately, the development of organic semiconductors based on columnar mesophases requires molecular design criteria that simultaneously address all of the aforementioned properties because a single structural change may affect many properties. Consequently, only few discotic columnar mesophases have been tested as active materials in organic electronic devices and the general perception is that the extra effort required for the design, purification, processing, and alignment of discotic columnar mesophases outweighs their potential benefits. I will conclude with proposing new and little explored approaches to discotic columnar mesophases that may be better suited for organic electronics.



(001)

(100)

super-column of hetero-heptamer

ITO Anode

Metal Cathode

$h\nu$

$e^-$

$h\nu$