

Information Technology needs Organic Chemistry: Graphene Nanoribbons as Molecular Semiconductors

Klaus Müllen

Max Planck Institute for Polymer Research, Mainz, Germany

How is synthetic and mechanistic organic chemistry related to the future of information technology and computing? The simple answer is that materials science urgently needs the expertise of organic and polymer synthesis. Along these lines we shall introduce graphene nanoribbons (GNRs) as a new generation of molecular semiconductors. Due to their unique electronic properties they hold promise to replace silicon in printed circuits. While we shall briefly address issues of bandgap control, processing and device fabrication, the essence of this talk is on chemistry: How can one synthesize GNRs longer than 600 nm and have them nevertheless structurally perfect and soluble? How can one functionalize them to carry spins for breakthroughs toward spintronics? How can one obtain atomically precise edges (armchair, cove, zig-zag)? What is the nature of electrocyclic reactions which transform 3D-polyphenylene precursors into flat 2D-graphenes?

