Presentation of Light-Matter Interactions for Middle School Students

West Las Vegas Middle School, May 2011

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NMHU, DMR 0934212

A series of presentations on light-matter interactions have been given at the West Las Vegas Middle School. These have served to promote connections between local schools and PREM program.

Three NMHU PREM students organized four different science presentations, each approximately one hour in length for 80 students total for the science class of Mr. Michael Tenorio (7th grade).

Topics covered:

- **Economic problems of electric power generation**
- **Light waves-particles**
- **Light sources**
- **Solar cells**
- **Flexible screens**

Base-Catalyzed Halogen-Dance Route to (Di)Keto-Bridged Bithiophene & Bithiazole Building Blocks for Optoelectronics

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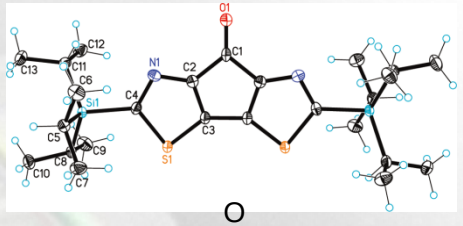
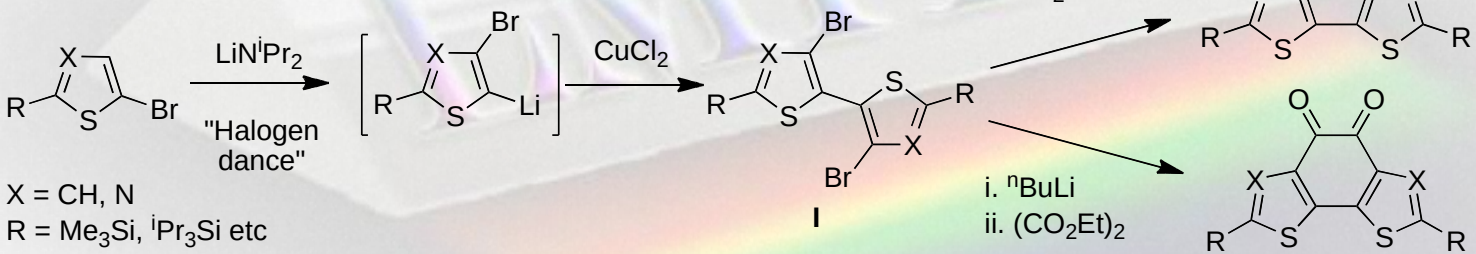
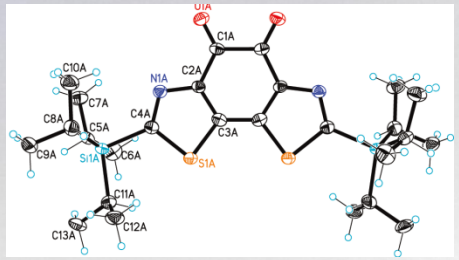
Planar electron-accepting π-systems are useful building blocks for both nonlinear optical and organic electronic applications. We have recently developed a convenient synthesis of dibromo bithiophenes and bithiazoles of type I (see below) that relies upon the base-catalyzed "Halogen dance", in which the lithiation initially takes place adjacent to the bromine atom, before changing places with it. Compounds I can be converted to a variety of tricyclic species including the keto and diketo species shown on the right. The structures of representative examples of intermediates and products have been confirmed by X-ray crystallography.





These species are strong electron acceptors, with dithiazole diketone (lower right) being particularly easy to reduce (−0.9 V vs. ferrocene) suggesting possible applications in n-channel organic field-effect transistors. We are currently working on incorporating these cores into more extending π acceptor structures.



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Angular tetrachloro[6]phenylene: a step toward circular phenylenes

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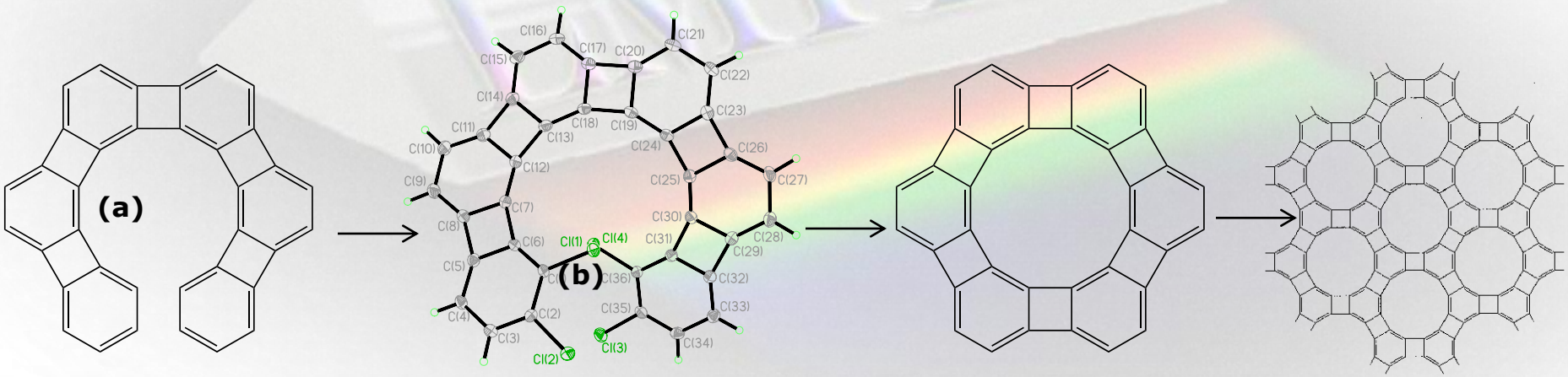
Carbon-rich compounds and materials have garnered much attention recently due to their small band gaps and thus applications as organic conductors and ferromagnets that form monolayers in solid-phase state. One such type of materials that can form carbon monolayers are [N]phenylenes, hydrocarbons built of fused alternating aromatic benzene and anti-aromatic cyclobutadiene rings. Vollhardt's group has developed efficient synthetic routes to this family of compounds, including helical angular phenylenes.



As a precursor for circular phenylenes, PhenyleneCl_4 crystals were studied. Scheme above shows transformation of molecular material into monolayers with potential conducting properties.

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