Surface Science Studies of Oligothiophene Adsorption on Clean and Modified Aluminum Surfaces

James E. Whitten, University of Massachusetts Lowell, DMR-0089960

- Oligomers, which are short-chain polymers, form an important class of materials for organic electronic devices.
- Sexithiophene is a leading candidate for organic field-effect transistors.
- Aluminum is commonly used as an electrode for organic devices.
- Understanding the bonding of sexithiophene with aluminum is critical for improving organic devices.
- Sexithiophene binds weakly to a clean Al surface. Small amounts of potassium on the surface affect the bonding by causing unoccupied electronic states of sexithiophene to be filled.

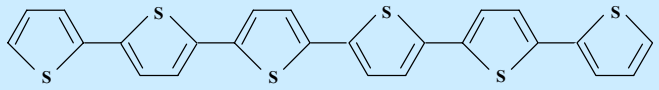

Figure 1: Chemical structure of sexithiophene.

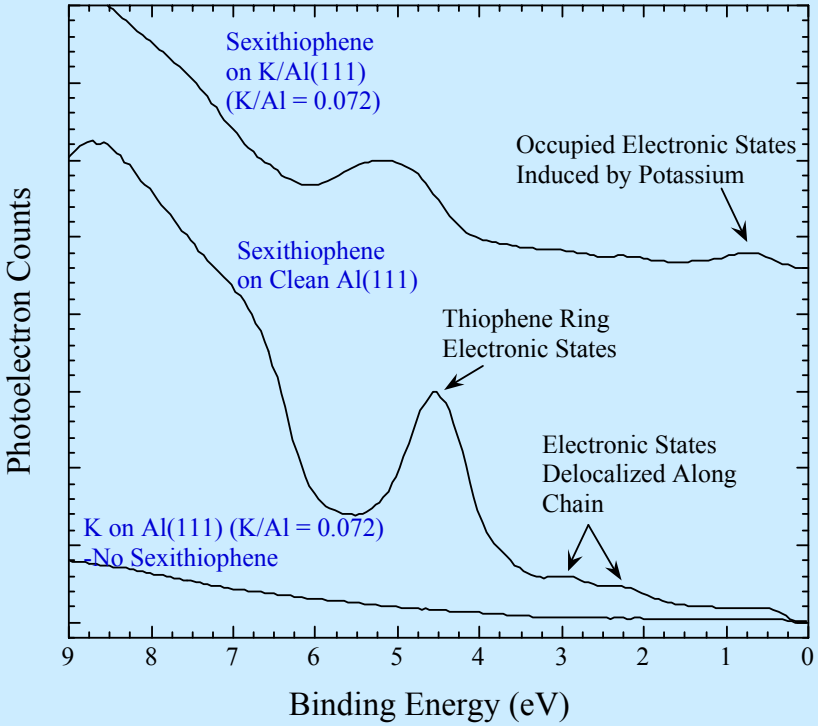

Figure 2. Valence electronic spectra for sexithiophene adsorbed on clean and potassium-dosed Al(111).

Surface Science Studies of Oligothiophene Adsorption on Clean and Modified Aluminum Surfaces

James E. Whitten, University of Massachusetts Lowell, DMR-0089960

Broad Impacts:

•Conjugated polymers and oligomers will comprise the next generation of optoelectronic devices.

•Because polymeric materials are flexible and readily processed, it may soon be possible to fabricate a flexible piece of plastic (perhaps as thin as paper) that contains light-emitting devices, transistors, and even its own power source (solar cells).

•Because metal electrodes (such as aluminum) must be in contact with the organic layer, this research is key to bringing organic electronics to fruition.

Education and Outreach:

• Several Ph.D. and M.S. graduate students and undergraduate chemistry majors have participated in this research. These students have gained important experience in materials chemistry, surface science, and organic electronics.

•As part of the educational component of this project, we have developed an experiment for the undergraduate physical chemistry laboratory that uses an infrared light-emitting diode to monitor the kinetics of the decomposition of gaseous ammonia by a hot tungsten filament.*

*J.D. Fischer and J.E. Whitten, *J. Chem. Educ.*, in press.