

NEW TYPES OF NANO-ELECTRONICS CONTACTS

Israel Temprano, Nathalie Dubuc, Mohamed Siaj and Peter H. McBreen
Université Laval, G1K 7P4, Quebec, Canada
chmite@hermes.ulaval.ca

The ability to develop new methods to enhance electrical contact between organic molecules and electrodes is fundamental to the design of devices that require electron flow between an organic component and a metallic component. Examples of such devices are organic thin film field effect transistors, where electrons flow from the source to drain electrodes through the organic film. The metal-organic contacts are the 'electrical plugs' in such a system. Metal-organic contacts using double and triple bonds is a promising approach in that it combines three advantages. These advantages are as follows: better electrical contact than for thiols, enhanced thermal stability, and activity for olefin-metathesis add-on chemistry¹.

The data presented in this poster show a new surface reaction leading to the formation of C=Mo double bonds to the surface of a conducting material, molybdenum carbide²⁻⁵. The metal-molecule contacts are found to be active for transalkylidenation and ring-opening polymerization (ROMP)⁶ reactions. For example, olefin-metathesis may be used to grow conjugated polymers directly from the carbide surface. Hence, the data suggest that olefin-metathesis procedures may be used to interconnect electrodes in nanodevices. Self-assembly of conjugated polymers may allow their targeted insertion into electronic and electrooptical devices.

References:

- [1] Tulevski, G.S., Myers, M.B., Hybertsen, M.S., Steigerwald, M.L., Nuckolls C., *Science*, **309** (2005) 591.
- [2] Zahidi, E-M., Oudghiri-Hassani, H., McBreen, P.H., *Nature*, **409** (2001), 1023
- [3] Siaj, M., Reed, C., Oyama, T., Scott, S.L., McBreen, P.H., *J. Am. Chem. Soc.*, **126** (2004) 9514
- [4] Siaj, M., Oudghiri-Hassani, H., Zahidi, E-M., McBreen, P.H., *Surf. Sci.*, **579** (2005) 1
- [5] Oudghiri-Hassani, H., Zahidi, E-M., Siaj, M., McBreen, P.H., *App. Surf. Sci.*, **212-213** (2003) 4
- [6] Siaj, M., McBreen, P.H., *Science*, **309** (2005) 588
- [7] http://nobelprize.org/nobel_prizes/chemistry/laureates/2005/chemadv05.pdf

Figures:

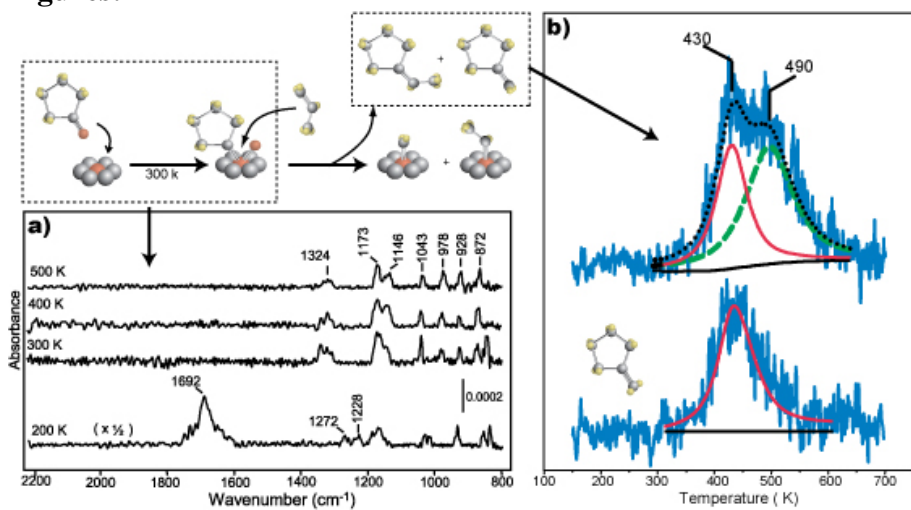


Figure 1

a) RAIRS and b) TPR spectra of active site formation for metathesis reaction on molybdenum carbide

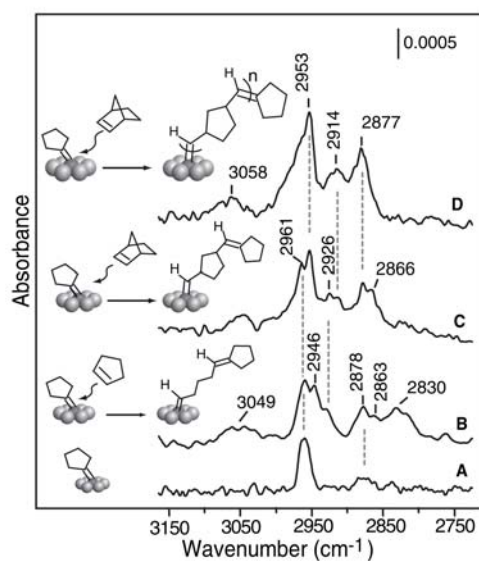


Figure 2

a) RAIRS spectra of Ring Opening Metathesis Polymerization from cyclopentylidene initiation sites on molybdenum carbide

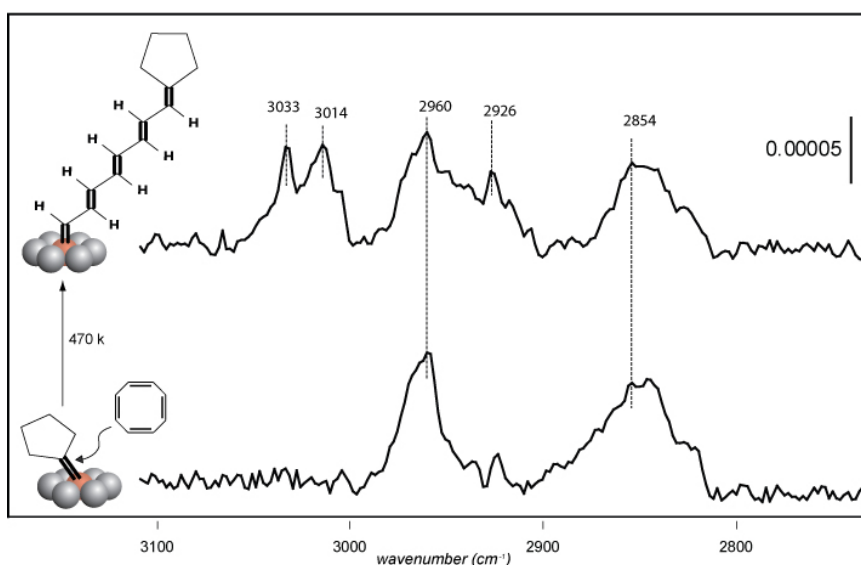


Figure 3

a) RAIRS spectra of a conjugated organic chain made by Ring Opening Metathesis Polymerization (ROMP) from cyclopentylidene initiation sites on molybdenum carbide