

**EVIDENCE OF STRONG C-H...O BONDS IN 2D ASSEMBLIES**

*Marc-Andre Laliberte, Stéphane Lavoie, Gautier Mahieu and Peter H. McBreen*  
*Université Laval, G1K 7P4, Quebec (QC) Canada*  
[chmmla@hermes.ulaval.ca](mailto:chmmla@hermes.ulaval.ca)

The necessity for continued miniaturization of devices underpins the study of atomic and molecular nanostructural engineering at surfaces. The approach of the present research is to understand and exploit intermolecular interactions for the formation of nanostructured assemblies on surfaces. The targeted assembly is a prochiral dimer on a Pt(111) surface. Metal surfaces are not intrinsically chiral. One approach to bestow chirality on surfaces is to add a chiral modifier<sup>1</sup>. Through subtle intermolecular interactions the modifier may guide substrate molecules towards face-specific reactions. This type of face-specific assembly is probably the most demanding form of 2D self-assembly.

The system presented in this poster shows H-bonded prochiral assemblies formed between aromatic chiral modifiers and carbonyl substrates on Pt(111)<sup>2,3</sup>. In particular, we isolate the intermolecular interactions between the coadsorbed aromatic and carbonyl functions<sup>4,5</sup>. Scanning tunneling microscopy (STM), reflectance FTIR (RAIRS) and thermal desorption studies show that chemisorption activates aromatics towards H-bond donation. Molecularly resolved STM images show that double H-bond donation occurs (Figure 1). That is, the carbonyl group of the substrate molecules docks between adjacent CH bonds of the aromatic. In this way 10:1 carbonyl-aromatic assemblies are formed. These nanostructures are stable under ultrahigh vacuum conditions at room temperature (Figure 2). The structures of the assemblies may be tuned through judicious substitution of the aromatic (Figure 3).

In summary a new type of strong (~2-4 kcal/mol) and strongly directional non-covalent interaction is demonstrated. This new interaction may be used in the design of 2D assemblies and in the design of new chiral catalysts.

**References:**

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## Figures:

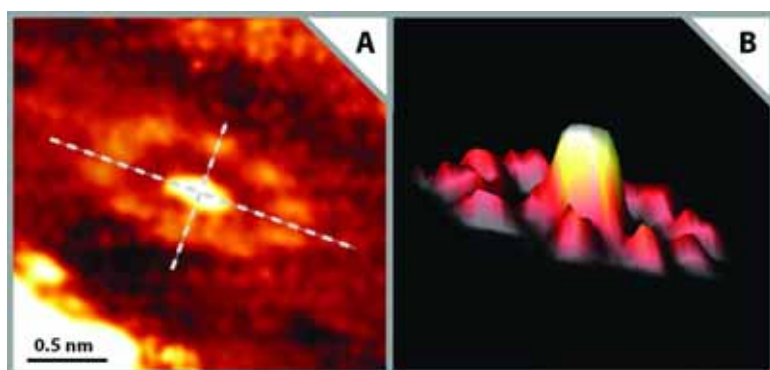


Figure 1

a) 10:1 carbonyl-aromatic assembly imaged by STM at low temperature (150 K), b) 3D representation

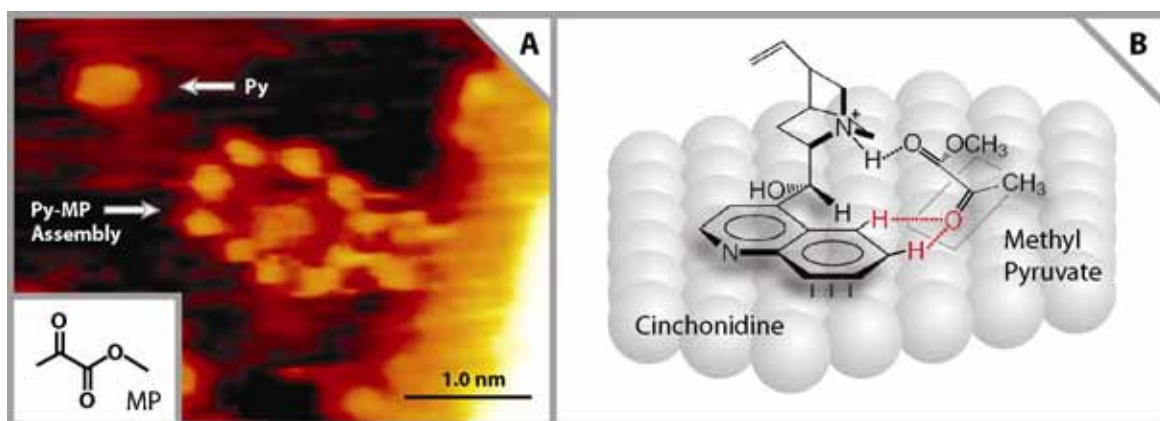


Figure 2

a) 10:1 carbonyl-aromatic assembly imaged by STM at room temperature, b) chiral assembly between a chiral modifier (cinchonidine) and a carbonyl compound (methyl pyruvate)

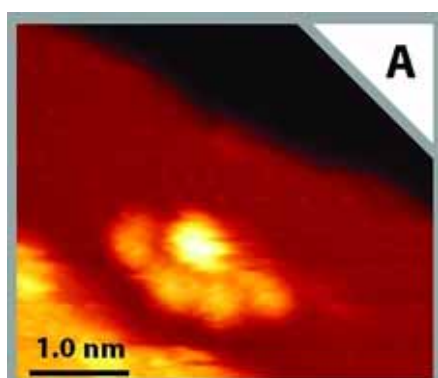


Figure 3

4:1 assembly with a substituted aromatic imaged by STM at low temperature