UNIVERSITY OF OREGON

Dept. of Chemistry and Biochemistry

Organic/Inorganic Seminar Series

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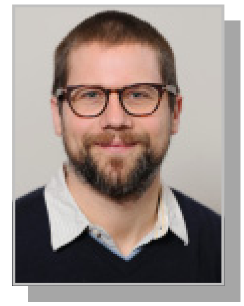


Hosted by Mike Haley

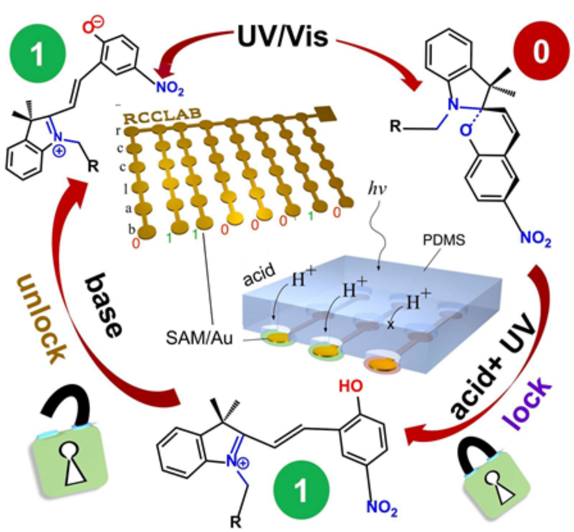
Thursday, May 2, 2019

Seminar at 2:30 pm, 331 KLA

Coffee reception prior at 2:00 pm

Molecular Switches on Surfaces and in the Solid-State

Organic Electronics exemplifies the versatility of organic chemistry in tuning electronic properties at the molecular level that translate into bulk, device properties; pushing frontier orbitals around moves energy levels in the condensed phase in a straightforward manner. But what about Molecular Electronics, in which molecules span both electrodes? As electrons tunnel from one electrode the other, they interact with the electronic structure of the molecule(s) at the quantum level, enabling control over electrical output by manipulating individual atoms synthetically or through external stimuli. Pushing frontier orbitals around, however, has little effect in such a junction because of the outsized influence of the electrodes. The situation is further complicated when ensembles of molecules span two electrodes where they can not only communicate electronically, but are in sufficiently close proximity to undergo irreversible intermolecular reactions.



In this talk I will discuss our recent work on addressing the thermodynamic limits of surface-bound switches in the context of Molecular Electronics. In the figure below, we combine light and chemical inputs to lock and unlock spiropyran-based switches in mixed monolayers, circumventing side-reactions and the thermodynamic instability of the merocyanine form of the switch, enabling the writing, erasing and rewriting of binary data on surface-bound switches.

In the second part of the talk, I will discuss a class of conjugated polyions that can be switched reversibility between insulating dielectrics, intrinsic semiconductors and metallic conductors using acid-base chemistry to control their band structures dynamically. We exploit their ionic nature to fabricate organic photovoltaic devices from non-toxic, renewable solvents.