123g Kinetics of Reactive Spreading of Thiols

Bartosz A. Grzybowski, Marcin Fialkowski, Christopher J. Campbell, and Kyle J.M. Bishop

Self-assembled monolayers (SAMs) of thiols that are delivered through micro- and nanocontact printing, as well as other means, are important tools in microfabrication and biotechnology. While microcontact printing often is a parallel technique—such that the thiol SAM remains where it is stamped—there have been a phenomenological examination of "reactive spreading" from PDMS stamps, dip-pen nanolithography and in edge spreading lithography. Recently, we and others have suggested that micropatterned hydrogel stamps can serve as a reservoir to controllably deliver large quantities of reagents onto various kinds of supports. Specifically, we have considered the use of hydrogel stamps that serve as reservoirs to micropattern both hydrophobic and hydrophilic thiols—something that is not possible with reservoir based PDMS methods. Here, we present a fundamental, theoretical explanation of reactive spreading by thiols when delivered from a hydrogel stamp. In this talk, I will explain from first principals what occurs in reactive spreading, from the interplay relating liquid spreading on the surface and monolayer building, the effects of head groups in ω-terminated alkanethiols, and the differences in adsorption kinetics between thiols and disulfides. In addition, implications to interfacial engineering and surface micro- and nanopatterning will be discussed.