

Surface Chemistry of N-Heterocyclic Carbenes

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N-heterocyclic carbenes (NHCs) are an exciting new class of carbon-based surfactants for metal surfaces. Self-assembled monolayers (SAMs) of NHCs can be prepared in solution or in the gas phase using air-stable hydrogen carbonate salt precursors. NHCs bind with unprecedented strength to a variety of metal surfaces, including gold, copper, ruthenium, platinum, and palladium. Extensive studies have been performed with copper and gold, where NHCs are shown to form tightly bound, densely packed monolayers.

Copper is a key component for fabricating integrated circuits, which are used in all modern electronic devices. These circuits consist of a series of interconnected electronic components that are embedded into a single piece of semiconducting material. To achieve the desired patterns, lengthy series of deposition and etching cycles are required. An area-selective deposition process which differentiates metal and dielectric regions would greatly enhance the production of electronic devices.

In this seminar, I will provide an overview of my PhD research which aims to achieve area selective deposition of NHCs on metal surfaces in the presence of common dielectric materials and demonstrate the ability of NHCs to prevent dielectric deposition on these metal surfaces.