“The Surface Chemistry Bottleneck”

Abstract. The ability to create synthetic surfaces with spatial and chemical complexity comparable to the cell surface could lead to new materials for optics, electronics, and healthcare. However, two primary challenges, namely the inability to localize organic reactions with nanoscale resolution and the lack of reactions that are appropriately suited for surfaces, have prevented the realization of strategies for creating synthetic surfaces with the complexity or functionality of their biological counterparts. To this end, the Braunschweig group is developing new tools and reactions for patterning surfaces with organic and biologically active ligands using catalytic, photochemical, and force-induced reactions. Significant recent breakthroughs arising from these efforts include a 3D nanoprinting strategy, the first method for patterning graphene covalently, and a more complete understanding of how force accelerates reactions on alkanethiol monolayers. This talk will focus on the reactions and tools available for patterning surfaces and the bottlenecks that must be addressed before printing with molecular scale precision can be realized.