4az Enantioselectivity on Naturally Chiral Copper Surfaces

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Enantioselective reactions are integral to most biological chemistry and large-scale pharmaceutical production. Enantioselective reactions require chiral media such as solvents, surfaces, or catalysts of a single handedness. Enantioselective heterogeneous catalysis is a promising method for the preparation of chiral compounds but requires catalytic surfaces with an inherently chiral structure. The stepped and kinked high Miller index surfaces of metals are naturally chiral and have been shown to interact enantiospecifically with chiral adsorbates.

Enantioselective desorption of small chiral molecules from such surfaces has been demonstrated and studied, but enantioselective reactivity on naturally chiral metal surfaces has only been explored in a cursory manner. Temperature Programmed Desorption (TPD) has been used to study the decomposition of chiral alkyl halides, such as, R-2-bromobutane and S-1-bromo-2-methylbutane, on the chiral $Cu(643)^{R\&S}$ and $Cu(531)^{R\&S}$ surfaces. Alkyl halides adsorb dissociatively to form R-2-butyl groups, which decompose via β-hydride elimination to yield various butenes. The selectivities to produce R-2-butyl groups, butenes, and other minor products are influenced by the chirality of the copper surfaces.