Enantioselective surface chemistry on chiral and achiral Cu surfaces

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Homochirality of life on Earth has significant implications in the production of pharmaceutical compounds. Developing a fundamental understanding of enantioselective adsorption and chemistry on the surfaces of catalytically active materials such as metals is essential for the rational design of enantioselective heterogeneous catalysts. Here, we show adsorption behaviors of chiral molecules on Cu metal surfaces; enantioselective adsorption and disproportionation of enantiomers. On naturally chiral Cu{3,1,17}$^{R\&S}$ surfaces, exposure of a racemic, gas phase mixture of D- and *L-aspartic acid results in establishment of an enantiospecific adsorption equilibrium with an enantiomeric excess of ~40% in the adsorbed phase. Exposure of the achiral Cu{111} surface to non-racemic aspartic acid leads to local amplification of enantiomeric excess on the surface, as a result of homochiral disproportionation. These adsorption behaviors are generally active and should be considered in all enantioselective chemical processes occurring on chiral or achiral surfaces.