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A Library of the Nanoscale Self-Assembly of Amino Acids on Metal Surfaces ERIN ISKI, ESMERALDA YITAMBEN, NATHAN GUISINGER, Argonne National Lab — The investigation of the hierarchical self-assembly of amino acids on surfaces represents a unique test-bed for the origin of enantio-favoritism in biology and the transmission of chirality from single molecules to complete surface layers. These chiral systems, in particular the assembly of isoleucine and alanine on Cu(111), represent a direct link to the understanding of certain biological processes, specifically the preference for some amino acids to form alpha helices vs. beta-pleated sheets in the secondary structure of proteins. Low temperature, ultra-high vacuum, scanning tunneling microscopy (LT UHV-STM) is used to study the hierarchical self-assembly of different amino acids on a Cu(111) single crystal in an effort to build a library of their two-dimensional structure with molecular-scale resolution for enhanced protein and peptide studies. Both enantiopure and racemic structures are studied in order to elucidate how chirality can affect the self-assembly of the amino acids. In some cases, density functional theory (DFT) models can be used to confirm the experimental structure. The advent of such a library with fully resolved, two-dimensional structures at different molecular coverages would address some of the complex questions surrounding the preferential formation of alpha helices vs. beta-pleated sheets in proteins and lead to a better understanding of the key role played by these amino acids in protein sequencing.

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