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Inorganic Surface and Structure Adhesion of Amino Acids and Peptides LARUE DUNKLEBERGER, ROBERT WILLETT, LOREN PFEIFFER, Bell Laboratories, Lucent Technologies — Interactions at the interface of biological molecules and inorganic materials are an open question in materials science; understanding these hybrid interfaces at the molecular level can have extensive basic and practical implications. In an extensive set of measurements we have systematically examined the adhesion of amino acids to a series of inorganic surfaces used in semiconductor devices. Peptides comprised of each of the twenty amino acids were exposed in solution to surfaces including metals, insulators, and semiconductors. Significant differential adhesion to the various surfaces is observed over the complement of amino acids, with adhesion determined largely by the amino acid side-chain charge. Mapping of adhesion findings for the amino acids versus materials in multiple solutions has been accomplished, in addition to examination of concentration and pH dependence. These results provide an empirical basis for building peptide to inorganic surface structures. In this vein, we have designed inorganic nano-structures using molecular beam epitaxy that are shown to selectively bind to prescribed primary peptide sequences. The inorganic structures fabricated here are shown to be able to discriminate between peptides with differences of only two to four amino acids. This surprising specific differential adhesion in both open surfaces to varied amino acids and in nanoscale structures to peptides is examined for the physical processes at play.

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