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Tracking Amino Acids in Chiral Quantum Corrals¹ ESMERALDA YITAMBEN, REES RANKIN, ERIN ISKI, JEFFREY GREELEY, Center for Nanoscale Materials, Argonne National Laboratory, RICHARD ROSENBERG, Advanced Photon Source, Argonne National Laboratory, NATHAN GUISINGER, Center for Nanoscale Materials, Argonne National Laboratory — Engineering molecular superstructures on metals opens great possibilities for the control and exploration of complex nanosystems for technological applications. Of particular interest is the use of chiral molecules, such as alanine, to build self-assembled nanoscale structures for the trapping of the twodimensional free electron gas of a metal. In the present work, molecules of D- or L-alanine were deposited on Cu(111). Scanning tunneling microscopy, spectroscopy, and density functional theory (DFT) revealed the formation of a uniform network of hexagonal chiral pores of average diameter ~ 1.2 nm. Each pore acts as a quantum corral by confining the two-dimensional electron gas of the Cu(111) surface state. Furthermore, each hexagonal pore acts as nanoscale tracks when excess alanine molecules were trapped at the inner perimeter of the pore, and were observed as rotating spatial states periodically moving between the six vertices of the hexagon. This study demonstrates the engineering of one of the smallest quantum confined structure, and the dynamics of molecular motion within these chiral potentials wells.

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