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Molecular chirality on a solid surface: thiaheterohelicene monolayer on gold imaged by STM

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Imaging of molecule-molecule recognition of chirality on a solid surface was attempted using scanning tunneling spectroscopy (STM) under ultra-high vacuum (UHV) conditions. The target molecule in this work, thiaheterohelicene ([11]TH), is a fused product which consists of five benzene rings and six thiophene rings. It has a helical chirality which can be compared to a spring washer. A racemic mixture of [11]TH was vaporized to prepare an adsorbed layer onto an Au(II)/mica substrate under UHV conditions. Images were obtained with molecular resolution on wide terrace areas and faceted narrow steps. The images obtained in the terrace areas show that the right handed and the left handed isomers were randomly adsorbed on the surface with little interaction. On the other hand, the images obtained in the steps showed that molecules of the same chirality formed a tightly packed row. The high resolution STM image obtained for [11]TH enabled us to distinguish not only the domain structures but also the domain compositions caused by the structural difference of the substrate