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Stereoselective attachment of S-Proline on Ge(100)

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The adsorption configurations of S-proline on Ge(100) were studied using scanning tunneling microscopy (STM), density functional theory (DFT) calculations, and high-resolution core-level photoemission spectroscopy (HRCLPES). We identified three adsorption structures of S-proline on Ge(100) through analysis of the STM images, DFT calculations, and HRCLPES results: (i) an 'intrarow O – H dissociated and N dative bonded structure', (ii) an 'O – H dissociation structure', and (iii) an 'N dative bonded structure'. Moreover, because adsorption through the N atom of S-proline produces a new chiral center due to symmetry reduction by N dative bonding, the adsorption configurations have either (R,S) or (S,S) chirality, yielding an (R,S)-'intrarow O – H dissociated and N dative bonded structure' and an (R,S)-'N dative bonded structure', with a preference for reaction at the Re face. This work presents a novel method for generating stereoselective attachment using S-proline molecules adsorbed onto a Ge(100) surface.