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Adsorption of Cysteine on Ge(100)

이한길[1]*, 윤영상[2], 신나리[1], 박선민[1], 양세나[1], 황한나[3], 황찬국[3], 김세훈[2]*

[1]숙명여자대학교 화학과, [2]한국과학기술원 화학과, [3]포항가속기연구소 빔라인부

The adsorption structure and surface reconstruction of cysteine molecules on a Ge(100) surface were studied using high resolution core level photoemission spectroscopy (HRCLPES) and low-energy electron diffraction (LEED) to track the variation in adsorption structure as a function of cysteine coverage. Analysis of the S 2p, C 1s, N 1s, and O 1s core level spectra revealed quite different behaviors according to cysteine coverage. At 0.10 ML, a single S 2p peak and a single N 1s peak were observed, consistent with an adsorbed structure with one type of thiolate conformation and a charge-neutral amino moiety. At 0.15 ML, two S 2p peaks emerged with a binding energy difference of 0.91eV, indicative of two types of thiolate, and two N 1s peaks appeared, consistent with the presence of both charge neutral NH_2 and charged NH_3^+ moieties. The relative population of the two thiolates induces a structural change in the ordering from 2 × 1 to 1 × 1 reconstruction. At coverage ~0.25 ML (the saturation coverage in our system), the LEED pattern becomes diffuse and a configurational change of the molecule occurs due to protonation of the NH_2 group and deprotonation of the -COOH group. We systematically elucidate the evolution of cysteine adsorption on a Ge(100) surface as a function of coverage.