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Selective adsorption between π conjugated and -SH functional groups of 1,4-benzenedithiol and benzenethiol on Si(111) 7x7 surface

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1,4-benzenedithiol(SH-C_6H_5-SH) and benzenethiol(C_6H_5-SH) were used to study the selective adsorption between pi conjugated functional group and -SH functional group on the Si(111)7x7 surface. They have been investigated using synchrotron radiation photoemission spectroscopy(core level and valence band spectrum) and STM(Scanning Tunneling Microscopy). Curve-fitting of the Si 2p core level spectra taken after 30L exposure shows the development of two new surface components, Si-S and S-H, shifted by +0.8 and +0.3 eV, respectively, from the bulk component. Therefore, the molecules adsorb on the Si(111) 7x7 surface at room temperature, not through the reaction of the pi conjugated functional group but through the dissociative adsorpton of -SH into S(ad) and H(ad). On the other hand, disappearance of adatom state of the valence band spectra at 30L exposure should be explained by different pathway which may follow the desorption as molecular hydrogen(H_2) formed by decomposited hydrogens after the dissociative adsorption of -S (ad) on two adatom sites. The STM study shows that the adsorption site of 1,4-benzenedithiol(SH-C_6H_5-SH) and benzenethiol(C_6H_5-SH) on the Si(111) 7x7 surface is consistent with spectroscopic analysis.