SM-P004

A Study of Long Range Band Bending Effect on the Ge(001) Surface by STM

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Despite growing interest in Ge as a possible alternative to Si, reliable data on Ge surface has been relatively scarce. Using low temperature scanning tunneling microscopy (STM), we investigate band-bending effects of localized charge traps at Ge(001) surface at 78 K. For this investigation, we prepared nearly defect-free Ge(001) surface by keeping the background pressure to $< 1\times10^{-10}$ mbar during outgassing. Ge(001) surfaces this obtained exhibit a flat-band condition, and deposition of charge traps induce a distinct, sharp boundary between pinned and depinned surface area in the constant current mode STM images. We will show the tip-surface interaction plays an essential role in producing the boundary, and discuss about the conditions that enable the pinning effect.

Keywords: scanning tunneling microscopy, STM, germanium, Ge(001)

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Preparation of Graphene Based PdOx and CuOx/MnOx Nanocomposites and Their Catalytic Applications in C-C Coupling and CH3SH Decomposition Reactions

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Graphene (G) has been modified with palladium, copper, and manganese oxide nanoparticles (NPs), and their catalytic applications have been studied in C-C coupling reactions and methylmercaptan (CH3SH) decomposition reactions. In this research, graphite oxide (GO) sheets were exfoliated and oxidized from graphite powder and impregnated with metal precursors including Pd2+, Cu2+, and Mn2+. The thermal treatments of the metal impregnated GO in preferred gas environments produced Pd NPs on graphene (Pd/G), PdO NPs on GO (PdO/GO), and CuOx and MnOx NPs on graphene (CuOx/MnOx/G). In case of Pd/G and PdO/GO, the TEM images show that, although the mean size of the Pd NPs changed significantly before and after the C-C coupling reaction, that of the PdO NPs didn't, implying that the PdO/GO was superior to Pd/G in terms of the recyclability. Also, we demonstrate that the CuOx/MnOx/G exerts the excellent catalytic efficiency in CH3SH decomposition reaction comparing with conventional catalysts. The chemical and electronic structural changes were investigated using XRD and XPS.

Keywords: Graphene, palladium, copperoxide, manganeseoxide, sonogashira, methtylmercaptan