**Molecular Dissociation at the $Fe_3O_4$(001) surface**

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The molecular dissociation at the single-crystalline $Fe_3O_4$(001) surface has been investigated using molecular $H_2$, $D_2$ and $N_2$ beams in the energy range of 3,5 - 8 keV and in the temperature range of 90K - 300K. Only a very broad peak was observed in the spectra of positive-charged scattered ions in the case of $H^+$ and $D^+$ ions, while that of the $N^+$ ions revealed a large asymmetric Fe-peak and a small O-peak. In the energy spectra of negative-charged ions under $N_2$ molecule bombardment, one broad peak was observed assigned to the $O^{-1}$ – recoil. In all cases, the peak intensity and peak width increases with increasing primary energy. A visible change in the molecular dissociation yields at the Verwey phase transition temperature of magnetite (~120 K) was observed indicating a strong correlation between molecule dissociation and the electronic state of the magnetite surface.