In-situ STM observation of the initial stage of the film growth

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The methods of deposition with energetic particles as dual ion beam sputtering (DIBS) and low energy direct ion beam deposition (LDIBD) have been investigated to develop multilayer structures for soft-Xray optics, because those are thought to be suitable to get smooth amorphous films with high packing density. In order to improve interface roughness of those multilayers, the mechanism of film growth with energetic particles has been studied. As part of the study, we developed a system to observe an initial stage of film formation by low energy ions in detail, combining an ultra-high vacuum scanning tunneling microscope (UHV-STM) and an ion beam assembly. In this paper we show the recent results of the observation of surfaces irradiated by low energy ions with the above mentioned system. The HOPG substrates were irradiated by C+ ions with energy from 25 eV to 150 eV and to the amount of 1,4,10 uC respectively at room temperature. As a result it was found that small carbon clusters are formed on the surfaces in the initial stage and incident atoms tend to be absorbed on a little bit off from the lattice points of the HOPG shown in Figure 1. The number of clusters is decreasing as the ion energy decreases until it reaches to the damage threshold in the energy range below 50 eV, but in the higher energy region the number is increasing as the energy decreases. Also the shapes of clusters, generation of defects and other subjects will be shown in my talk.