

Deposition of Cu thin films on glass substrate by  
Ionized Cluster Beam deposition for laser mirror at room temperature

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Ionized cluster beam deposition(ICBD) of Cu thin films on glass at room temperature were carried out to fabricate Cu laser mirror with good structural and reflectance properties. At constant film thickness of 600Å, the grain size of the as-grown Cu films increased with the acceleration voltage, and there were no any indication of defects such as cracks and/or large pores in the film surface as shown in scanning electron microscopy images.  $R_{ms}$  roughnesses( $\sigma$ ) of the films with thickness of 600Å were calculated by atomic force microscopy images. The  $\sigma$  increased when the acceleration voltage increased from 0kV to 2kV, and decreased at 3kV. The  $\sigma$  of the film grown at 4kV, however, increased again. In order to investigate dense degree of the films according to the acceleration voltage, resistivities were measured for films with thickness of 600Å by d.c. four point probe method. The resistivities were strongly dependent on existence of the acceleration voltage. That is, the films with the acceleration voltage showed twice lower resistivities than that of the film made at neutral beam condition. The resistivities of each film, however, were near same regardless of the acceleration voltage. At the acceleration voltage of 3kV, reflectance of the films increased with the film thickness and decreased at the film thickness of 800Å. The ratio of Cu reflectance to commercial Al laser mirror reflectance showed that the Cu films at 3kV had higher reflectance. Our results suggested that it is possible to grow the Cu film with good structural and optical properties on glass substrate at room temperature by ICBD.