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The Effect of Concurrent Ion Bombardment on the Surface Morphology of Thin Films Grown by Ion Beam Assisted Deposition

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The control of surface morphology on growing thin films has been one of the subjects that has been pursued for a long time. These days, concurrent ion beam bombardment onto the surface of growing thin films has been used to control the surface morphology and microstructure of thin films succesfully.

In this work, an ion beam assisted deposition system was constructed and used for growth of Ag and Ta_2O_5 thin films on Si by Ar^+ and O_2^+ ion beam assisted deposition, respectively. The effect of concurrent ion bombardment on the surface morphology of thin films grown by ion beam assisted deposition was studied by SEM and AFM measurements. Various parameters of concurrent ion bombardment such as ion beam energy, ion flux, and sample rotation were changed to study their effects on the surface morphology of growing thin films.

The surface roughness of 100nm Ta_2O_5 grown by oxygen ion beam assisted deposition was better than 1 nm. The effect of oxygen ion energy was not significant. For Ag thin films growth by ion beam sputtering, the effect of Ar^+ ion assist was not great. Above 200 eV Ar^+ ion energy, the effect of resputtering was very clear and it deterriorated the surface morphology.