

Characterisation of a high intensity hydrogen plasma for materials processing

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A cascaded arc plasma is used as a remote source for plasma treatment of solid state materials. The ion and electron densities as well as temperatures are determined by Langmuir probe measurements. Microwave interferometry measurements are performed as a double check on the probe measurements. Two photon Laser Induced Fluorescence and active actinometry are performed to determine neutral atom densities. Since ion temperatures are low (0.1-1 eV) and no substrate bias is applied, no ion-induced substrate damage is expected. To verify this, AFM is used to measure the surface roughness of crystalline silicon before and after plasma treatment. To rule out possible pollution of the plasma by tungsten or copper from the plasma source diamond and crystalline silicon samples are investigated after exposure to the plasma. RHEED and SIMS measurements are carried out to determine the effect of pollution on the surface of the samples. Results show that ion densities in the plasma can be varied between 10^{15} and 10^{18} m^{-3} . Temperatures are low (0.1-1 eV). Neutral atom densities up to 10^{21} m^{-3} have been achieved. No significant surface damage or pollution is detected.