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High quality coatings with high deposition rate by PECVD with improved hollow cathode plasma

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A new type of Hollow Cathode device has been developed by AGC Plasma, the industrial vacuum equipment manufacturing segment of AGC. The scale-up of this device has been successfully performed for Plasma-Enhanced Chemical Vapor Deposition [PECVD] coatings on lab samples (a few cm²) up to jumbo-sized glass plates (3.2x6.0m²).

Many thin film coating applications require optical stacks including a thick layer. However, conventional vacuum deposition technologies like magnetron sputtering require too much processing time to be economically viable for such thickness. New coating process like PECVD (as done by Hollow Cathode) is now able to reach a very high deposition rate unlocking new possibilities.

This lab study is confirming both the performance of the new process and the coating quality. The main body of this paper is focused on SiO₂ deposition onto flat glass substrates at low temperature and under low pressure, which is compatible with inline production including PVD. The deposited films have been fully characterized including thickness, content, stress, and density.

Results have shown that carbon free silicon oxide coating can be obtained using typical precursor materials with well-tuned process parameters. OH fraction into the film deposited at low temperature needs to be reduced to maintain the desired density, especially after thermal treatment. SiO₂ deposition rate can be very high (at least 10 times higher than regular PVD). This process is not limited to SiO₂. Hollow Cathode PECVD can allow for coatings of a wide variety of other materials, like carbide, nitride or oxy-nitride if other precursors or reactive gases are injected.

Keywords

PECVD

Hollow Cathode

Coating

SiO₂

Si₃N₄