Cleaning of glass surfaces using diffuse coplanar surface barrier discharge in ambient air

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Diffuse Coplanar Surface Barrier Discharge (DCSBD) is a novel type of atmospheric-pressure plasma source capable of generating diffuse "cold" atmospheric-pressure plasma layers in air, oxygen and other standard plasma gases at extremely high plasma power densities reaching the order of 100W/cm³. The DCSBD plasma generated in ambient air consists of two optically different segments: the diffuse plasma and the filamentary streamer plasma. We found that close contact between a flat glass surface and the DCSBD plasma layer led to an increase in the diffuse plasma, and contact with conductive ITO glass resulted in total extinction of streamer plasma.

As indicated by XPS, MALDI and surface energy measurements, a 3-sec. treatment with glass surface results in a complete hydrophilization of the glass surface due to a significant reduction of adsorbed organic contaminants and an increase in surface hydroxyl group density. The efficiency of the proprietary DCSBD-based method for glass surface treatment will be demonstrated by the results for sol-gel TiO₂ layer deposition, CONLOC glass bonding, lamination of PVB sheets, nanoparticle surface immobilization and ITO conductive glass cleaning. Abrasive measurements on TiO₂ coatings showed significant increases in adhesion and coating quality on plasma-cleaned glass surfaces, whereas untreated glass surfaces showed poor adhesion of TiO₂ coatings.

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