

13.56 MHz Inductively Coupled Plasma Source ICP-P 200



Fig. 1: ICP-P 200

Morphology of polystyrene films deposited by RF plasma

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The work described below was performed using a JE PlasmaConsult ICP-P 200 inductively coupled plasma source.

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Abstract

A new plasma reactor, set up with a large planar inductively coupled source, is used for the first time to deposit a polymer coating (pPS) from a styrene monomer. This work is devoted to the relationship between external plasma parameters and substrate topography, and pPS coating morphology, which is investigated by scanning electron microscopy and atomic force microscopy. Stainless steel, gold and glass surfaces are used as substrates. It is clearly demonstrated that the film morphology can be controlled by adjustment of RF input power, pressure. The analysis performed further reveals that the pPS film's characteristics strongly depend on the substrate topography and its electrical potential during the discharge. Finally, the plasma duration also strongly influences the morphology of the films. The morphologies obtained include smooth films without any specific feature, worm-like structures, particles (nanometer- and micrometer-sized) associated along preferential directions and randomly distributed particles (micrometer-sized). The intrinsic topography of the substrate influences the film structure in the case of thin films (thickness lower than about 100 nm).

Polymerization is suggested to take place at the surface in contact with the discharge rather than in the gas phase. Nucleation and growth start preferentially on substrate defects such as polishing scratches.

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