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Plasma monitoring of nanoparticles formation in SiH4/H2 discharges GIANNIS ALEXIOU, GIANNIS TSIGARAS, ELEFTHERIOS AMANATIDES, DIMITRIOS MATARAS, Plasma Technology Laboratory - Department of Chemical Engineering - University of Patras, PLASMA TECHNOLOGY LABORATORY - DEPARTMENT OF CHEMICAL ENGINEERING - UNIVERSITY OF PATRAS TEAM — Radio-frequency SiH4/H2 discharges is the most common technique for the growth of silicon thin films. Nanoparticles formation and uncontrollable agglomeration to dust is common drawback of such type of discharges due to the extensive reactivity of the species produced in the gas phase. In this work, we deposited silicon films in different plasma conditions while monitoring at the same time nanoparticles formation. The experiments were performed under Continuous Wave (CW) and Pulsed Plasma generation in order to control particles formation. Different time-resolved plasma diagnostics, such as Optical Emission Imaging, Laser Light Scattering and self-bias voltage (Vdc) measurements were used for the detection of particles. Mass spectrometry was also used to record higher silanes formation during the deposition. The deposited films were characterized in terms of crystallinity, hydrogen content and optical properties by Laser Raman, Fourier Transformed Infrared and UV/Vis spectroscopy. Finally, Atomic Force Microscopy (AFM) was applied to monitor the morphology and roughness of the films. The properties and the morphology of the deposited films are compared in order to determine the effect of the particles formation on the material's quality.

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