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Structural Determination of Nanocrystalline Si Films Using Raman Spectroscopy and the Ellipsometry

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Abstract : Hydrogenated microcrystalline silicon (µc-Si:H) thin films were prepared by radio frequency magnetron sputtering at relatively low growth temperatures (Ts=100 °C). The films grown on glass substrate in order to use the new generation of substrates sensitive to elevated temperatures. Raman spectroscopy was applied to investigate the effect of the argon gas diluted in hydrogen, on the structural properties and the evolution of the micro structure in the films. Raman peak position, intensity and line width were used to characterize the quality and the percentage of the crystallites in the films. The results of this investigation suggest the existence of a threshold dilution around a gas mixture of argon (40%) and hydrogen (60%) for which the crystallization occurs, even at low deposition temperatures. The difference between the amorphous and the crystallized structures is well confirmed by spectroscopic ellipsometry (SE) technique.

Keywords : Silicon, Thin films, Structural properties, Raman spectroscopy, Ellipsometry
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