

Investigation of Internal Gettering at Low Temperatures of Metallic Elements in HEM Wafers mc-Si for Photovoltaic Solar Cells

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Abstract : The main aim of this study is to investigate the low temperature internal gettering of manganese and chromium transition metals content in p-type multicrystalline silicon grown by Heat Exchanger Method (HEM). The minority carrier lifetime variation, the transition metal elements behavior, the sheet resistivity and the interstitial oxygen concentration after different temperatures annealing under N₂ ambient were investigated using quasi-steady state photoconductance technique (QSSPC), secondary ion mass spectroscopy (SIMS), four-probe measurement and Fourier transform infrared spectrometer (FTIR), respectively. The obtained results indicate in the temperature range of 300°C to 700°C that the effective lifetime increases and reaches its maximum values of 28 μ s at 500 °C and decreasing to 6 μ s at 700 °C. This amelioration is due probably to metallic impurities internal gettering in the extended defects and in the oxygen precipitates as observed on SIMS profiles and the FTIR spectra. From 300 °C to 500 °C the sheet resistivity values rest unchanged at 30 Ohm/sq and rises significantly to reach 45 Ohm/sq for T> 500 °C.

Keywords : mc-Si, low temperature annealing, internal gettering, minority carrier lifetime, interstitial oxygen, resistivity

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