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Raman spectroscopy of PIN hydrogenated amorphous silicon solar cells KIMITAKA KEYA, YOSHIHIRO TORIGOE, SUSUMU TOKO, DAISUKE YAMASHITA, HYUNWOONG SEO, NAHO ITAGAKI, KAZUNORI KOGA, MASAHARU SHIRATANI, Kyushu University — Light-induced degradation of hydrogenated amorphous silicon (a-Si:H) is a key issue for enhancing competitiveness in solar cell market. A-Si:H films with a lower density of Si-H_2 bonds shows higher stability [1]. Here we identified Si-H_2 bonds in PIN a-Si:H solar cells fabricated by plasma CVD using Raman spectroscopy. A-Si:H solar cell has a structure of B-doped μc-SiC:H (12.5 nm)/ non-doped a-Si:H (250nm)/ P-doped μc-Si:H (40 nm) on glass substrates (Asahi-VU). By irradiating HeNe laser light from N-layer, peaks correspond to Si-H_2 bonds (2100 cm^{-1}) and Si-H bonds (2000 cm^{-1}) have been identified in Raman scattering spectra. The intensity ratio of Si-H_2 and Si-H I_{SiH2}/I_{SiH} is found to correlate well to light induced degradation of the cells Therefore, Raman spectroscopy is a promising method for studying origin of light-induced degradation of PIN solar cells.

[1] T. Nishimoto, et al., J. Non-Crystal. Solids 299-302 (2002) 1116.

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