Abstract Submitted
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Deposition rate enhancement of cluster-free P-doped a-Si:H films using multi-hollow discharge plasma CVD method[1] KENTA NAKAHARA, YUKI KAWASHIMA, MUNEHARU SATO, TAKEAKI MATSUNAGA, KOUSUKE YAMAMOTO, WILLIAM M. NAKAMURA, DAISUKE YAMASHITA, HIDEFUMI MATSUZAKI, GIICHIRO UCHIDA, KUNIHIRO KAMATAKI, NAHO ITAGAKI, KAZUNORI KOGA, MASAHARU SHIRATANI, Kyushu University, SHIRATANI LAB TEAM — We have realized highly stable a-Si:H films of $4.7\text{x}10^{15}$ cm^{-3} in stabilized defect density at a high deposition rate of 3 nm/s using a multi-hollow discharge plasma CVD method by which incorporation of clusters into the films is drastically reduced [1]. To realize a-Si:H solar cells of a high efficiency, we have deposited cluster-free n-layer a-Si:H films by PH_3+SiH_4 multi-hollow discharge plasma CVD. The deposition rate sharply increased from 0.49 nm/s with increasing a gas flow rate ratio R= $[PH_3]/[SiH_4]$ from 0 % to 1.17 nm/s for R= 1.0 %, then slightly increases to 1.27nm/s for R= 10%. SiH emission intensity monotonically increases with R. A high surface reaction probability β of 100% for $R > 1\%$, is estimated from the deposition rate. These results suggest the surface reaction rates of SiH_x radicals are enhanced by PH_x radicals.

[1] W. M. Nakamura, et al., Surface and Coating Technologies (2010) in press.

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