

HWCVD를 이용한 태양전지 용 다결정 실리콘 박막 증착에 대한 바이어스의 영향

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Effect of bias on the deposition of HWCVD poly-Si thin films for solar cell

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Abstract : In order to investigate the effects of electric bias applied to the substrate and charged nanoparticles generated in the gas phase on the deposition behavior of silicon thin films, polycrystalline silicon films were deposited by hot wire CVD (HWCVD) using the gas mixtures of 10%SiH₄-90%H₂ and 20%SiH₄-80%H₂ at a substrate temperature below 100 °C. Mixtures of large number of negatively and small number of positively charged nanoparticles were generated in the gas phase and captured on a transmission electron microscopy (TEM) grid during film deposition. Nanoparticles ranging from 5 nm to 10 nm were observed by TEM. The production ratio of negatively to positively charged nanoparticles increase with decreasing SiH₄ concentration in the gas mixtures. Electric biases of +150 V and -150 V were applied to the substrates, stainless steel and polyethylene terephthalate (PET), during silicon deposition. Growth rates on stainless steel increase with applying a bias of +150 V as well as -150 V to the substrate. Growth rates on PET film increase at an applied bias of -150 V and decrease at an applied bias of +150 V. This results were interpreted by the difference of the electrical conductivity of PET and stainless steel substrate. Growth rate and crystallinity of HWCVD silicon film appears to be affected by applying the biases to the substrates, by the electric conductivity of the substrates, and by the ratio of negatively to positively charged nanoparticles in the gas phase.

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