a-Si 막의 Band-gap과 Deposition-rate간의 비선형 거동을 통한 플라즈마 영역의 경계 규명

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Differentiating Plasma Regions Through the non-Linear Relationship between the Band-gap and the Deposition-rate of a-Si Thin Films

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Thin film a-Si solar cells deposited by PECVD have many advantages compared to the traditional crystalline Si solar cells. They do not require expensive Si wafer, the process temperature is relatively low, possibility of scaling up for mass production, etc. In order to produce thin film solar cells, understanding the relationship between the material characteristics and deposition conditions is important. It has been reported by many groups that the band gap of the a-Si material and the deposition rate has an linear relationship, when RF power is used to control both. However, when the process pressure is changed in order to control the deposition rate and the band gap, a diversion from the well known linear relationship occurs. Here, we explain this diversion by the deposition condition crossing different plasma regions in the Paschen curve with a simple model. This model will become a guide to which condition a-Si thin films must be fabricated in order to get a high quality film.

Key words : PECVD(플라즈화화학기상증착), Band-Gap(밴드갭), Thin Film Amorphous Silicon Solar Cell(비정질실리콘박막태양전지), Plasma Region(플라즈마 영역), Paschen curve(파스첸 곡선)

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후면식각이 결정질 실리콘 태양전지에 미치는 영향에 관한 연구

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The effect of rear side etching for crystalline Si solar cells

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Nowadays, the crystalline Si Solar cell are expected for economical renewable energy source. The cost of the crystalline Si solar cell are decreasing by improvement of its efficiency and decrease of the cost of the raw Si wafers for Solar cells. This Si wafer based crystalline Si solar cell is the verified technology from several decade of its history. Now, I will introduce one method that can be upgrade the efficiency by using simple and economical method. The name of this method is Rear Side Etching(RSE). The purpose of rear side etching is the elimination of n+ layer of rear side and increase of the flatness. The effects of rear side etching are the improvement of Voc and increase of efficiency by reducement series resistance and forming of uniform BSF. The experimental procedure for rear side etching is very simple. After anti-reflection coating on solar cell wafer, Solar cell wafer is etched by the etching chemical that react with only rear side not front side. This special chemical is no harmful to anti-reflection coating layer. It can only etched rear side of solar cell wafer. We can use etching image by optical microscope, minority carrier life time by WCT 120, SiNx thickness and refractive index by ellipsometer, cell efficiency for the RSE effect measurement. The key point of rear side etching is development of etching process condition that react with only rear side. If we can control this factor, we can achieve increase of solar cell efficiency very economically without new device.

Key words : Rear side etching(후면식각), Back side etching(후면식각), Crystalline Si Solar cell(결정질실리콘태양전지)

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