TF-P027

Light Scattering from Microscopic Structure and Its Role on Enhanced Haze Factor

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We have prepared alumina (Al2O3) doped zinc oxide (AZO) films by DC magnetron sputtering (MS) technique and obtained higher self surface texturing at a high target angle (f). We have characterized the films and applied it as a front electrode of a single junction amorphous silicon solar cell. At a lower f the deposited films show higher values of optical gap (Eg), charge carriers mobility & concentration, crystallite grain size and wider wavelength range of transmission. At higher target angle the sheet resistance, surface roughness, haze factor etc for the films increase. For f=72.5o the haze factor for diffused transmission becomes 6.46% at 540 nm wavelength. At f=72.5o the material shows a reduction in crystallinity and evolution of a hemispherical-type sub-micron surface textures. A Monte Carlo method (MCM) of simulation of the AZO film deposition shows that such an enhanced self-surface texturing of the films at higher f is possible.

Keywords: light scattering, AZO, microscopic structure, haze factor