

Novel optically-rough and physically-flat $\text{Zn}_{1-x}\text{Mg}_x\text{O}$: Al substrate for superstrate-type thin-film solar cells



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Novel optically-rough and physically-flat (OR-PF) $\text{Zn}_{1-x}\text{Mg}_x\text{O}$:Al thin film substrate was developed for superstrate-type thin-film solar cells. It was fabricated by spin-coating sol-gel Al doped $\text{Zn}_{1-x}\text{Mg}_x\text{O}$ (AZMO) thin film on roughened glass substrate with a two-dimensional grating structure. Uniform and periodic feature size was formed on the glass substrate by using room-temperature nanoimprinting technique. Effect of shape and period of feature size on the optical properties of OR-PF AZMO substrate was investigated. It was applied as the front electrode of hydrogenated amorphous silicon (a-Si:H) single junction solar cells. Figure 1 shows the SEM micrographs of glass substrate imprinted with hole pattern (Period (P) = 1.7 μm) and OR-PF AZMO/hole patterned glass substrate. The AZMO/hole (P=1.7 μm) patterned substrate shows low optical absorption, an average haze ratio in transmission of 13.1 % at wavelength region of 700-850 nm, a low surface roughness, and a sheet resistance of 62.7 Ω/sq . These results suggest the potential of this OR-PF AZMO substrate for the front electrode of superstrate-type thin-film solar cells.

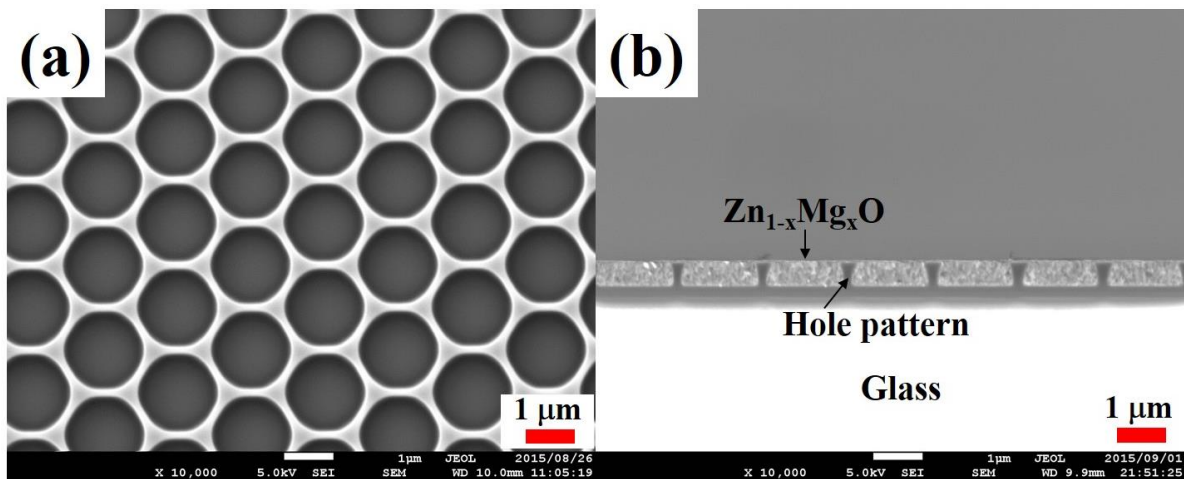


Fig.1 (a) SEM micrograph of the surface of the glass substrate imprinted with hole pattern (P=1.7 μm) and (b) SEM micrograph of the cross section of the OR-PF AZMO/hole (P=1.7 μm) patterned glass substrate.

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