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Influences on optoelectronic properties of damp heat stability of AZO and GZO for thin film solar cells

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Abstract

This study investigates the effects of damp heat stability on the optoelectronic properties of ZnO:Al (AZO) and ZnO:Ga(GZO) films with respect to thin-film solar cells. The lowest resistivities of AZO and GZO thin films are 8.2621×10-4 Ω-cm and 2.8561×10-4 Ω-cm, respectively. After damp heat testing for 999h, the resistivities of AZO and GZO thin film increase by 39.72% and 11.97%, respectively. XPS binding energy analysis shows that the AZO thin film has a higher O 1s spectrum than the GZO thin film. Thus, the carrier concentration of films decreases, as a higher binding energy is attributed to the chemisorbed oxygen atoms (O-).

Experimental results show that after expousre to a damp heat test at 85℃

and 85% relative humidity for electrical, optical, structural, and morphological analysis, GZO films are more stable than AZO films.

Key words: Damp heat; Optoelectronic; Pulsed DC magnetron sputtering; ZnO:Al; ZnO:Ga