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ZnO:Al films by a reactive mid-frequency sputtering process from dual rotatable targets.

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Aluminum doped zinc oxide films (AZO) is a transparent conducting oxide (TCO) suited for applications in photovoltaics, for example, as a front electrode in CIGS solar cells. For such applications, high quality films are required, presenting a low resistivity and low absorbance. Present processes rely on the use of ceramic targets to sputter the oxide film. The advantages of such process are its stability and reproducibility. On the other hand, the high production cost of ceramic targets is a serious disadvantage. A good alternative for cost reduction is a reactive process from lower cost metallic targets. Nevertheless, a reactive process needs sophisticated control in order to obtain constant film properties. In this work, AZO thin films were produced by reactive mid-frequency sputtering from dual rotatable targets (133 mm diameter x 700 mm length). The oxygen partial pressure is measured by lambda probes and the average power of the power supply is controlled by a feedback system in order to stabilize the process in the desired working point. Such system was designed to be an industrially suited process, capable of producing high quality films, with equivalent or better properties than state-of-the-art films, and with reproducible properties. Films were characterized in terms of electrical and optical properties. The suitability of these films for applications in solar cells is discussed.

Keywords

solar cells
electrode
zinc oxide
aluminum
reactive