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Determination of durability and optical properties for Low-E coating ZnTiAlO / Ag / ZnTiAlO

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Low-emissivity glasses (Low-E) allow to reflect middle infrared (IR) produced by heated object or human body while letting visible sun light in. This is a major goal for energy saving and, in the actual climate context, it is a very interesting technology. This particular optical property can be easily achieved by a thin noble metal as silver, gold or copper. Among them, silver show the lowest absorbance in visible range [1]. However, the silver layer is easily ripped off if it is not protected by surrounding layer(s). In this way, a seed layer promotes the growth of silver layer and a barrier layer protect the silver layer to avoid the ripping off of the silver [2,3].
Several compounds have been used as seed and growth layers such as Bi_2O_3, In_2O_3, SnO_2, TiO_2, ZnO and ZnS. Among them, ZnO is interesting due to its large gap, its low cost and its abundance. Utilization of dopants in ZnO enables to increase the chemical stability and to reduce the stress of the Low-E stack [4]. However, limited work show results for co-doped ZnO on the durability. In this way, we propose to study a periodic table IV type element (Ti) and Al to increase the electronic density of the layer, and so to improve the durability of the Low-E stack.
Moreover, for industrial applications, the use of metallic targets in reactive DC mode may be advantageous because it allows to the control the stoichiometry of deposited films with regulation. Thus, Ti and Al co-doped ZnO (ZTAO) films are deposited by reactive co-sputtering between ZnAl and Ti targets. Low-E film durability and optical properties related to the composition of ZTAO films are investigated in this work.
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