Ag thin film coating to reduce absorbers' substrate thermal emittance

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Massive use of fossil fuels is one of the main causes of environmental pollution and global warming but, at the present time, they still represent the principal source of energy production [1]. Improving the exploitation of Solar energy could positively impact the energy transition to renewable. Evacuated flat plate solar collectors (EFPCs) convert solar energy directly into heat with high efficiency thanks to high vacuum insulation. The vacuum environment allows to neglect convective and conductive losses making the Selective Solar Absorber (SSA) radiative losses the only mechanism of thermal loss. Thermal emittance affects the efficiency of the SSA mounted on EFPCs more than solar absorbance [2].

The state of art offers different works about optimization (maximizing efficiency) of SSA's absorbing part [3,4], but further improvement can be obtained reducing the substrate emissivity. We therefore electron beam deposited Ag low emissivity thin film coatings on the aluminium substrate of a commercial SSA to improve the absorber performances by reducing its thermal emittance. The thermal emittance was measured as function of temperature through a calorimetric approach [5]. The thermal stability of the coating and the use of Cr_2O_3 thin film, as a diffusion barrier, was also investigated.

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