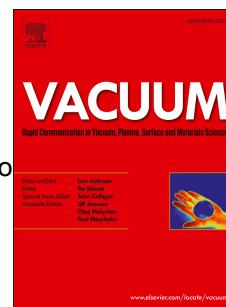


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Solar selective coatings with multilayered structure based on thermal spraying WC-Co solar absorption layer

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Abstract: Based on the outstanding high-temperature stability of WC-Co coating prepared by high-velocity oxy-fuel (HVOF) spraying, CuCoMnO_x, CuCoMnO_x-SiO₂, and SiO₂ sols synthesized by sol-gel method were deposited successively on the coating after grinding the surface of it. CuCoMnO_x was used as sealing layer to fill the larger pores and grooves on the surface, then, the composition CuCoMnO_x-SiO₂ sol was deposited as the second sealing layer to eliminate the remaining smaller pores as well as transition layer to connect the sealing layer and the uppermost SiO₂ anti-reflective layer. The absorptance (α) of the new multilayer structure coating obtained through this way increased from 0.821 to 0.915 and the emittance (ϵ) decreased from 0.434 to 0.290. After being annealed for 50h at 550°C under non-vacuum environment, the α and ϵ of the multilayered coatings stack changed to 0.901/0.320. The structural transformation of the coatings and mechanisms of its improvement were investigated by X-ray diffraction (XRD), scanning electron microscope (SEM), energy dispersive spectrometer (EDS) and laser scanning confocal microscope (LSCM). The results indicated that with the deposition of sol films in turn, defects on the surface of WC-Co coating were gradually reduced and formed a compact surface eventually, in correspondence, roughness of it reduced. And the formation of good element gradients in multilayer structures might be the explanation for its substantial improvement in optical performance.

Keywords: solar selective coatings, multilayered structure, CuCoMnO_x, HVOF, sol-gel method

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