Cermet structured Pt/Al₂O₃ thin films as solar selective absorber coatings at high temperature

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Cermet structured Pt/Al₂O₃ thin films were prepared and investigated for use as solar selective absorber coatings at high operating temperatures, ranging from 400 to 800 °C. The thin films were deposited using a reactive co-sputtering deposition technique on stainless steel foils and silicon wafer substrates. The resulting materials were analyzed using scanning electron microscopy, glazing incident X-ray diffraction, high-resolution transmission electron microscopy, secondary ion mass spectrometer and X-ray absorption near edge structure. The optical performance of the obtained solar selective absorber coatings was examined using UV-Vis-NIR spectrophotometry and Fourier transform infrared spectrometry. The thermal stability was examined by annealing the samples at different temperatures ranging from 400 to 800 °C in vacuum. We show that cermet structured Pt/Al₂O₃ solar selective absorber coatings exhibit high absorption greater than 93 % from 0.3 to 2.5 μm after heat treatment at high temperature and low emittance less than 1 % from 2.5 to 10 μm at 100°C.

Keywords
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X-ray absorption near edge structure