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Thermal stability of multilayered Pt-Al2O3 nanocoatings for high temperature CSP systems

Z.Y. Nuru [a, b, *], L. Kotsedi [a, b], C.J. Arendse [c], D. Motaung [d], B. Mwakikunga [d], K. Roro [d, e], M. Maaza [a, b]

a *UNESCO-UNISA Africa Chair in Nanosciences/Nanotechnology, College of Graduate Studies, University of South Africa (UNISA), Muckleneuk Ridge, P O Box 392, Pretoria, South Africa*
b *Nanosciences African Network (NANOAFNET), iThemba LABS-National Research Foundation, Old Faure Road, 7129 Somerset West, South Africa*
c *Department of Physics, University of Western Cape, Private Bag X 17, 7535 Bellville, South Africa*
d *DST/CSIR National Center for Nano-Structured Materilas, Council for Scientific and Industrial Research, P O Box 395, 0001 Pretoria, South Africa*
e *R&D Core-Energy, Council for Scientific and Industrial Research, P O Box 395, 0001 Pretoria, South Africa*

Abstract

This contribution reports on the effect of thermal annealing on sputtered Pt–Al(sub2)O(sub3) multilayered selective solar absorber coatings deposited onto stainless steel substrates with a Mo IR reflecting buffer layer. The Pt–Al(sub2)O(sub3) cermet nanocoatings were annealed at different temperatures for different durations in vacuum. The spectral selectivity of the optimised Pt–Al(sub2)O(sub3) was found to be thermally stable up to 900 °C in vacuum for 2 h with solar absorptance of 0.944 and thermal emittance of 0.11. At 1000 °C, its spectral selectivity decreased significantly to 0.892/0.13, which is attributed to the inter-diffusion between the layers, and formation of -Fe(sub3)Mo(sub3)C phase. Annealing the Pt–Al(sub2)O(sub3) nanocoatings for long term showed that the cermet nanocoatings were thermally stable up to 800 °C in vacuum for 24 h having spectral selectivity of 0.938/0.10.