



Simulation Studies on Ceramic Coatings on Aluminium thin films for Solar Reflector Application

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Abstract: Concentrating solar power technologies is one of most promising and competitive energy source for the future and it is necessary to develop aluminum reflector coating on polycarbonate substrate material that are low in weight and cost, maintain high reflectance under harsh condition in outdoor environments. Oxidation significantly reduces aluminum's reflectance in the ultraviolet and causes light scattering throughout the spectrum. For long-term performance, protective layer will be necessary and the addition of adhesion-promoting layer could improve durability. The front surface of the protected aluminum coating on polycarbonate substrate reflects an average of 0.90 over UV Vis NIR spectrum region. Aluminum coated with a ceramic film arrests oxidation, minor abrasion resistance and helps maintain a high reflectance. Overcoating metallic coatings with a hard, single, ceramic layer of half-wave optical thickness improves abrasion and tarnish resistance but marginally reduces optical reflectance from 0.92 to 0.90. Optimised thickness of aluminum thin film of 200nm and protective layer SiO₂ of 200nm gives a maximum reflectance of 0.90.

Keywords: Reflectance, UV- Vis- NIR, Solar reflector, Simulation & Optimization.

Muralidhar Singh M *et al* /Int.J. ChemTech Res. 2015,8(12),pp 360-366
