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ALUMINA MATRIX WITH CONTROLLED MORPHOLOGY FOR COLORED SPECTRALLY SELECTIVE COATINGS

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Abstract

This study presents the results obtained in tailoring thin films of alumina, deposited onto aluminium substrates by spray pyrolysis, at 250°C, using $AlCl_3$ solutions (0.15M) in a water:ethanol (1:1) solvent mixture. As morphology controlling agents, acetylacetone and maleic acid based copolymers are added in the precursors' solutions. The precursors' systems are analyzed by FTIR spectroscopy and the surface morphology of alumina thin films is investigated by atomic force microscopy. The addition of hydrophilic copolymer in precursors' solution favors the development of regular open structures, while fractured large open structures are obtained when hydrophobic copolymer is used. The addition of acetylacetone in spraying solution leads to irregular large open structures. Combined additive systems (acetylacetone and hydrophylic/hydrophobic copolymers) have a complex influence and can be a tool in tailoring the morphology of the alumina thin films, as suitable matrix for further infiltration of red (Fe_2O_3) and gray-green (Cu_xS) pigments and development of colored solar selective absorber coatings with promising optical performances. Thus, spectral selectivities (S) of 3.4 - 4.07 are obtained for red absorber coatings, while for gray-green absorber coatings spectral selectivities are slightly lower (S = 2.35 - 2.7).

Key words: alumina matrix, colored spectral selective coatings, solar-thermal collectors, spray pyrolysis deposition

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