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Abstract

We report on creation of metallurgic bond between AZ91 magnesium alloy and aluminium plasma sprayed coatings which has been so far observed only after additional surface treatments. High-enthalpy plasma spray process employing water-stabilized plasma torch was used to spray commercially pure aluminium and AlCr6Fe2 alloy and, thus, creating around 200 and 450 μm thick coatings, respectively, with presence of aluminium oxides. For both coatings, metallurgical bond layers with thickness around 100 μm and notable for their eutectic morphology were obtained. Analyses of microstructure, elemental and phase compositions revealed that the bond layer with the commercially pure aluminium coating is dominantly $Al_{12}Mg_{17}$ while the bonding with AlCr6Fe2 alloy comprises of both $Al_{12}Mg_{17}$ and Al_3Mg_2. Despite presence of porosity, the coatings' polarization resistance measurements showed increased values as compared with the bare substrate. Results of adhesion tests did not confirm the deterioration of adhesion strength due to the presence of intermetallics in the bond, and more important factor was the phase composition and microstructure of the coatings. The thickness of the metallurgic bond can be thermally controlled via the substrate preheating and/or its thickness.