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Abstract

In-situ synthesized ZrC-Al_3Zr reinforced composite coatings were fabricated on AZ91D magnesium alloy with a mixture of Al, Zr and B_4C powders by laser cladding. Granular ZrC reinforced phase was synthesized in all 10 wt.%, 20 wt.% and 30 wt.% (Zr+B_4C) coatings, while Al_3Zr with rod-like morphology was found only in the two latter coatings. Al_3Zr was replaced by $Al_{9.83}Zr_{0.17}$ at the content of 10 wt.% (Zr+B_4C) because of relatively low content of Zr. The size of most ZrC and Al_3Zr was less than 3μm. $Al_{12}Mg_{17}$, α-Mg, AlB_2 and Al_3Mg_2 were also detected at the composite coatings. The syntheses of ceramic phase and some intermetallic compounds increased the hardness of the coating. The maximum hardness value (346 HV) was obtained at the coating with 30 wt.% (Zr+B_4C), which was 5 times higher than that of the substrate. The composite coatings also had better wear resistance than AZ91D substrate and the friction coefficient of the coatings decreased with the increase of (Zr+B_4C) content. Polarization curves indicated that the composite coatings were harder to corrode than the substrate.