Degradation mechanism of rare earth modified Al-Mg-Zn matrix composite reinforced with ceramics particles

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Abstract Rare earth modified Al-Mg-Zn matrix composites reinforced with TiC and Al_2O_3 ceramic particles are successfully prepared via *in situ* reaction of $Al:TiO_2:C:RE_2O_3$ system during self-propagating high-temperature synthesis. The *in situ* reaction mechanism, preparing parameters, microstructure evolution and corrosion behavior are studied by X-ray diffraction, scanning electron microscopy, optical microscopy and various corrosion tests. The results showed that the added rare earth oxides could minimize the dimension of *in situ* particles and refine the grain size of Al-Mg-Zn matrix composites with an average size of 50 μm. Moreover, the rare earth oxides could promote the dispersion distribution of *in situ* particles. Based on the above-mentioned results, the corrosion behavior of Al-Mg-Zn matrix composites reinforced with TiC and Al_2O_3 ceramic particles is investigated by microstructure characterization, electrochemical experiments and density function theory calculation. The results indicated that the addition of TiC and Al_2O_3 particles reduces the corrosion resistance of the composite material. Further, the corrosion mechanism of rare earth modified Al-Mg-Zn matrix composites reinforced with TiC and Al_2O_3 ceramic particles is discussed.

Keywords Corrosion behavior, Al-Mg-Zn matrix composite, rare earth oxides, density function theory calculation

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