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**Interdiffusion kinetics of the intermetallic coatings on AZ91D magnesium alloy  
formed in molten salts at lower temperatures**

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**Abstract:** A continuous Mg–Al diffusion coating can be formed on the AZ91D Mg alloy by the diffusion coating treatment in molten salts in the lower temperature range from 280 to 400 °C. The microstructure and composition of the diffusion coatings were investigated by scanning electron microscopy and energy dispersive X-ray analysis. The results showed that the diffusion coating consists of continuous  $\gamma$ -Mg<sub>17</sub>Al<sub>12</sub> phase and  $\beta$ -Mg<sub>2</sub>Al<sub>3</sub> phase. The  $\beta$ -Mg<sub>2</sub>Al<sub>3</sub> phase layer grows faster than the  $\gamma$ -Mg<sub>17</sub>Al<sub>12</sub> phase layer. The interdiffusion coefficients for each phase were investigated by Heumann's method. As the temperature increases from 320 to 400 °C, the interdiffusion coefficient in  $\gamma$ -Mg<sub>17</sub>Al<sub>12</sub> phase ( $\tilde{D}_\gamma$ ) increases from  $2.2 \times 10^{-12}$  to  $9.6 \times 10^{-11}$  cm<sup>2</sup>/s. When the temperature increases from 360 to 400 °C, the interdiffusion coefficient in  $\beta$ -Mg<sub>2</sub>Al<sub>3</sub> phase ( $\tilde{D}_\beta$ ) increases from  $3.5 \times 10^{-10}$  to  $7.4 \times 10^{-10}$  cm<sup>2</sup>/s. The activation energies for the interdiffusion in  $\gamma$ -Mg<sub>17</sub>Al<sub>12</sub> and  $\beta$ -Mg<sub>2</sub>Al<sub>3</sub> phases are 155.9 and 66.3 kJ/mol, respectively.

**Keywords:** Magnesium alloy; Intermetallic coatings; Molten salt; Diffusion;

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