关于 HTML 格式论文展现的通知

本刊从 2021 年第 5 期开始，将英文版（即官网中文版前 15 篇英文论文）开始用 HTML 格式在本刊官网（www.rmme.ac.cn）展现。读者可以点击论文标题下的[HTML]打开 HTML 格式论文。由于正在改版试用过程中，相关问题还在不断修订，请读者谅解。

HTML 格式论文的优点如下：

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2）可以在网络上顺畅浏览，也可以碎片化阅读。

3）可以下载高质量的图表。

HTML 基本展现格式如下：


In-situ Reaction Dynamics of Mg_2Si/Al Composites Fabricated by Laser Deposition

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Full Text　Figs & Tabs　References　Authors　About　CN　CITE

2.2 Dynamic model of in-situ Mg_2Si/Al composite

3 Conclusions

References

Abstract

In-situ magnesium silicide/aluminum (Mg_2Si/Al) composites were fabricated by laser deposition. A dynamic model of in-situ Mg_2Si/Al composites was established. The laser power (system temperature), Mg-rich layer thickness, Si particle size, and Al content were identified as the main factors affecting the reaction rate and degree. Results show that increasing the laser power (system temperature) and reducing the Mg-rich layer thickness, Si particle size, and Al content accelerate the reaction rate and degree.

Keywords

laser deposition; in-situ synthesis; Mg_2Si; aluminum matrix composites; dynamic mechanism

Science Press

1 Experiment

Pure Al, Mg, and Si powders were used with the average size of ~74 μm. The Mg-to-Si powder ratio corresponded to the stoichiometric ratio of Mg_2Si. The powders were mixed in a high-energy ball mill filled with Ar gas for 2 h. Fig.1 shows the morphology of powder mixtures after milling. During milling, the mass ratio of the ball-to-powder mixtures was 2:1. The targets included 10wt% and 15wt% Mg_2Si separately in the Al matrix after laser melting in-situ synthesis, namely 10wt%Mg_2Si/Al and 15wt%Mg_2Si/Al. The substrate 6061 Al plate was machined to 100 mm×100 mm×10 mm. The substrates were polished to remove the oxide layer and then sandblasted to roughen the surface. Laser processing was conducted by the Laserline LDM2500-60 semiconductor laser. The laser output power was 800, 900, 1000 and 1200 W; the laser beam scanning velocity was 200 mm/min; the diameter of the laser beam spot was fixed at 1.5 mm by defocusing. To prevent the melted pool from heavy oxidation, high-purity Ar gas at 10 L/min was used as protective gas through the coaxial nozzle.

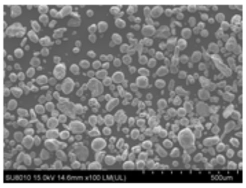

Fig.1 Morphology of powder mixtures after milling

The laser deposited samples with dimension of 70 mm×10 mm×10 mm were obtained. Metallographic samples were obtained by cutting transversely from the middle of the deposited samples and then polished and etched with 0.5vol% HF solution for scanning electron microscopy (SEM) observation with the Tesan VEGAII Lmh system. The phase constitution was determined by SEM with energy dispersive spectroscopy (EDS). The phases were analyzed by X-ray diffraction (XRD) at 40 kV and 40 mA using Cu-Kα radiation (Max-2000X) at 1873 K for 1 h in argon atmosphere.

2 Results and Discussion

2.1 Microstructure

Fig.2 shows the effects of laser power on the microstructure of 10wt%Mg_2Si/Al. Chinese

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Influence of Molybdenum Addition on Oxidation Resistance of CrN Coatings

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Abstract

To investigate the effect of molybdenum (Mo) addition on microstructure and oxidation resistance of CrN coating, Cr-Mo-N coatings with different Mo contents were fabricated on silicon wafers and high speed steel by reactive magnetron sputtering and annealed at elevated temperatures from 500 °C to 800 °C in air for 1 h. The coatings before and after annealing were characterized by X-ray diffraction (XRD), Raman spectroscopy and scanning electron microscope (SEM). The results show that the as-deposited CrN and Cr-Mo-N coatings all exhibit B1 face-centered cubic (fcc) phase based on the CrN lattice. Mo ions substitute for Cr ions in Cr-N lattice, forming the solid solution Cr-Mo-N coatings. At 600 °C, XRD and Raman spectra show that the MoO_3 phase forms in Cr-Mo-N coatings with higher Mo contents, indicating a coarser surface with higher oxygen content. At 700 °C, the cross sectional morphology of the CrN coating exhibits loose columnar grains with some porous regions due to the internal stress while the Cr-Mo-N coating shows the dense columnar structure. This study reveals that the Cr-Mo-N coatings with lower Mo contents (<17at%) have better oxidation resistance than the CrN coating does.

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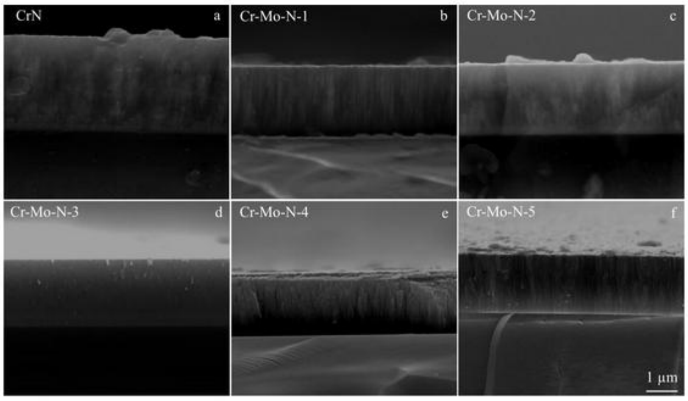

Fig.2 Cross-sectional morphologies of Cr-Mo-N coatings with different Mo contents: (a) CrN, (b) Cr-Mo-N-1, (c) Cr-Mo-N-2, (d) Cr-Mo- N-3, (e)

激光沉积Mg_2Si/Al的原位反应动力学

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Full Text Figs & Tabs References **Authors** About CN CITE

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CN 引用

Abstract

In-situ magnesium silicide/aluminum (Mg_2Si/Al) composites were fabricated by laser deposition. A dynamic model of in-situ Mg_2Si/Al composites was established. The laser power (system temperature), Mg-rich layer thickness, Si particle size, and Al content were identified as the main factors affecting the reaction rate and degree. Results show that increasing the laser power (system temperature) and reducing the Mg-rich layer thickness, Si particle size, and Al content accelerate the reaction rate and degree

of the composites are shown in Fig.4 and Table 1, respectively. The results indicate that the polygonal particles and Chinese script particles are Mg_2Si, which is in agreement with the pseudobinary phase diagram of Al-Mg_2Si[15]. The microstructure of in-situ Mg_2Si/Al composites fabricated by laser deposition consists of α-Al phase, Si phase, and Mg_2Si particles.

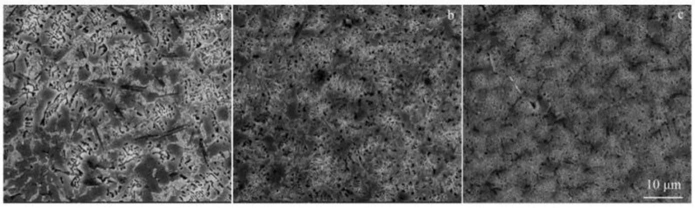

Fig.2 Microstructure of 10wt%Mg_2Si/Al composite with laser power of 800 W (a), 1000 W (b), and 1200 W (c)

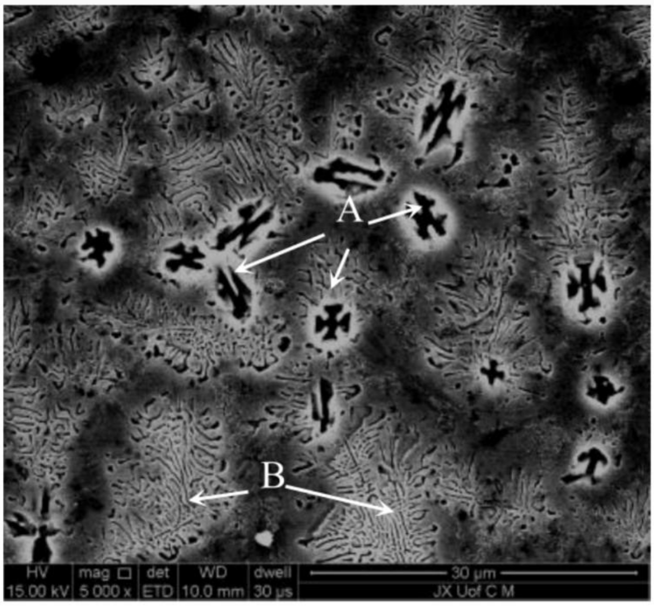

Fig.3 Microstructure of 15wt%Mg_2Si/Al with laser power of 900 W

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