

A NEW PARTICLES ADDING TECHNIQUE FOR PREPARATION OF METAL MATRIX COMPOSITE USING SPRAY DEPOSITE^①

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ABSTRACT Mixing reinforced particles into compressed gas, pressing them into the nozzle and then being atomized with the melt, the particles will be distributed uniformly in the matrix, so that the bond force between the particles and matrix and the mechanical properties of the composite materials were improved.

Key words atomize reinforced particles spray deposition

1 INTRODUCTION

Metal matrix composites (MMCs) prepared using spray deposition technique can overcome many shortages, such as high oxygen content, composition segregation, existing in the MMCs materials prepared by traditional processing^[1, 4].

This kind of MMCs have excellent comprehensive properties, which have replaced some traditional materials and have been applied to aviation, military, automobile field.

When using traditional spray deposition technique, the reinforced particles are added by one or more additional feeder which is located near the jet nozzle^[1, 3, 5]. However, under the impacting of high compressed gas reinforced particles can not be effectively caught by atomized melt drops and the escape quantity of particles is larger. As a result, it leads to low deposition efficiency and can not guarantee the uniform distribution of particles in the deposite and the bond force between particles and the matrix is also weak. For this reason, we have developed a new particle adding technique in which particles are mixed into high compressed gas at first, and then the matrix metal melt is atomized by this kind of high compressed gas containing rein-

forced particles^[2]. Using this kind of particles adding technique, reinforced particles can be effectively caught by the melt drops, the escape quantity of particles is less and the reinforced particles can be uniformly distributed in the deposite.

2 TECHNIQUE SCHEME

The mentioned above new particles adding processing and the apparatus are shown in Fig. 1. A particle introducing device is inserted between the gas introducing tube 6, and the jet nozzle 3. This kind of particle introducing device consists of a jet eductor 5, a hollow mixing chamber 4, a particle supply cone 7, a screw feeder 8, a cylinder 9. In addition, there is a pin hole 10 at the bottom of the cylinder. When the apparatus works, the screw feeder push the reinforced particles into the cylinder and the particles will become a kind of suspension under the blowing of gas from the pin hole 10. At the same time, compressed gas enter chamber 4, through the jet eductor 5, which causes the negative pressure in the front of the jet eductor 5. It is the negative pressure that can absorb the reinforced particles in the cylinder 9, into the cham-

① This new technique has applied for Chinese patent(CN 95238105. 2); Received Jan. 15, 1996

Fig. 1 A kind of particles adding installation for the preparation of MMCs using spray deposition

ber 4, when the high compressed gas containing the reinforced particles is pushed out the jet nozzle, the choke pole 13, in the crucible with a leak pipe 1, will automatically arise and the matrix metal melt 2, is atomized. The fine atomized melt drops with caught reinforced particles will be deposited on the movable metal plate 11, which is hollow and is cooled by water in the atomized chamber 12. The experiment results show that this new particle adding technique can prepare MMCs deposite with high quality.

3 CONCLUSION

The performance of the particles reinforced metal matrix composites depends mainly on the distribution condition of the reinforced particles in matrix, the more uniform particles distribution in the matrix is, the better the performance of the MMCs is. The new particle adding tech-

nique for the preparation of MMCs by mixing reinforced particles into compressed gas first, then pressing them into the nozzle and then being atomized with the melt can guarantee the reinforced particles being uniformly distributed in the matrix, thus leading to the prepared MMCs possessing excellent mechanical performance.

REFERENCES

- 1 Zhang Jishan, Chen Guoliang. Materials Science and Engineering, (in Chinese), 1995, 13(1): 21.
- 2 Chen Shizhu, Yin Zhimin *et al.* Chinese Patent Appl. CN95238105. 2.
- 3 Shen Jun, Jiang Zuling *et al.* Materials Science and Technology, 1995, 3(1): 100– 103.
- 4 Gupta M, Mohamed F A, Lavernia E J. In: Inter Symp on Advances in Processing and Characterization of Ceramic and Metal Matrix Composites, Halifax, Canada, 1989: 236.
- 5 Reginald Gwyn Brooks. US 3909921.

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