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Compaction of powdered materials reinforced with milled W-B fibers

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INTRODUCTION

Fibrous composite materials such as Al-W-B, are effectively used in newest technical industries because of their high durability, small weight and other valuable properties [1]. The paper discusses methods of compaction of powder materials, reinforced by W-B fibers.

EXPERIMENTAL METHODS

For experimental studies mixtures on the base of iron, aluminum and copper powders with W-B fibers. Compaction was performed by magnetic-pulse pressing and hot isostatic pressing. Microstructure were studied with Keyence VHX-2000E digital microscope. Study of material microhardness, elastic modulus was carried out in the SCM laboratory (Peseux, Switzerland) by CSM Nano Indentation Tester (NHT), tribology by CSM Tribometer (TRB). The effect of compaction and sintering parameters on the final properties of the material was established.

RESULTS AND DISCUSSION

For the preparation of mixtures were used crushed Al-W-B composite with 3-10 mm particles size and the W-B fibers, obtained after the separation of aluminum matrix by etching. Grinding of initial material was carried out in several stages: cutting of materials, grinding in a jaw crusher, double-triple grinding in disintegrator. Table 1 shows composition of aluminum based composite.

| B | Al | W | Mg | Mn | Fe |
|------|------|-----|-----|-----|-----|
| 47.0 | 43.2 | 5.0 | 2.7 | 1.1 | 0.6 |
| 5 | 6 | 6 | 8 | 6 | 3 |

Study of the microstructure showed that the samples subjected to heating to 575 °C after dynamic compaction have more uniform distribution of the structural elements in

comparison with subjected to heating to 590 °C. (Fig.1.).

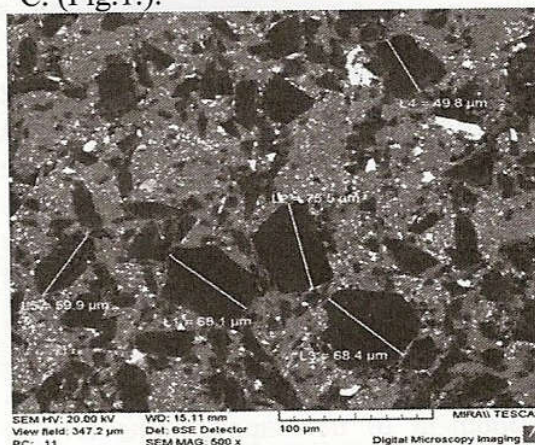


Fig.1 . Structure of Al-W-B composite samples after dynamic compaction and heating to a temperature 575 °C

CONCLUSION

Research has shown that the most technologically advanced and promising is a method of combined pressing that includes static compaction and impulse action on the material. Hot isostatic pressing of powders containing W-B fibers in aluminum ampoules allowed to reach maximal density, but its use for the manufacture is problematic.

REFERENCES

- [1] V. Mironov, O. Filippov, I. Boyko. Estonian Journal of Engineering, 2010, p. 142-149.

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