FABRICATION OF NANO-GRAINED TiC/Ti_5Si_3 MICRO-MOLDS BY THE LIGA-MA PROCESS

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Abstract

The importance of metals and ceramics is increasing for microsystem in reproduction and molding techniques because of the mechanical and physical properties. In this study, we have developed a new process using LIGA mold which is able to cast a microstructure of alloys or ceramics using a Spark Plasma Sintering (SPS) machine. Concretely, we apply the mechanical alloying (MA) process as well as a pseudo-superplasticity to produce a micro-mold made of these composites. Powders of Ti and SiC whose composition was Ti-20mass%SiC were blended for MA, and the MA powder whose average particle size is less than 1 μm, i.e., nano-particle, has an amorphous structure. The MA powder is filled into a micro-mold produced by the LIGA process, and cast by SPS in order to fabricate a new micro-mold as a transcription of the micro-mold by the LIGA process. As the result, this process was proved successful in making the micro-mold made by TiC/Ti_5Si_3 ceramic composites, whose Vickers hardness is extremely superior to an Ni mold produced by the general LIGA process.

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