A Study on the Machinability of A356/SiCp Composites

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ABSTRACT

The aims of this study are to investigate the machinability of different A356/SiCp composites by Taguchi method. Through setting different cutting parameters, the relationship between the quality of cutting and the mechanical properties for the composites was investigated. The experiments set the SiCp reinforcement contents are 5wt.%, 10wt.% and 20wt.%. The composites are heat-treated by the T6 precipitation hardening heat treatment or not. And the cutting varabiles studied are the tool materials, the cutting speed, the feed rate and the depth of cut. The machinability evaluated are the cutting force, the surface roughness of machined surface and the tool wear amount. Finally, the microstructures of tool worn surface, the machined broken section area of tensile bars and the machined surface of the composites are observed to realize the machinability. The results of research show that the cutting force is increased with increasing the depth of cut, the cutting speed and the feed rate because the opportunity of tool touching against SiCp is increased with increasing SiCp contents. After the composites added above 10wt.% of SiCp, and by heat-treated, the surface smoothness and the machinability of the composites can be improved. The most effective factor for the machinability of A356/SiCp composites are the cutting tool material and the SiCp content. When increasing the hardness of composites, the tool flank wear will be mostly reduced, but will be increased with inereasing SiCp content. It was suggested to untilize CBN tool to cut the composites with SiCp over 10wt.% content, the results can show that better surface smoothness and less flank wear were obtained. While for the composites with less then 10wt.%SiCp, the TiC tool was suggested to be used. No matter what kinds of cutting tools, it cannot get better surface smoothness for them to cut the A356 alloy and the A356+5wt.%SiCp composites.

Keywords : Taguchi Method, A356 Aluminum Alloy, A356/SiCp Composite, Machinability, T6 Precipitation Hardening Heat Treatment

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