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Optimization of surface roughness in micro-high speed end milling of soda lime glass using uncoated tungsten carbide tool with compressed air blowing (Conference Paper)

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Abstract

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Soda lime glass is a very important material in diverse manufacturing industries, including automotive, electronics, and aerospace. In these applications, the glass surface needs to be defect free and without impurities. However, the machining of glass is difficult due to its inherent brittleness which leads to brittle fracture and easy crack propagation. This research investigates the high speed micro-end milling of soda lime glass in order to attain ductile regime machining. It has been found by other researchers that ductile mode machining can avoid brittle fracture and subsurface cracks. Also, in this study, a special air delivery nozzle is used to blow away the resultant chips and keep the machined surface clean. To accomplish this, Design Expert software and a commercial NC end mill were used to design and perform the machining runs, respectively. The surface roughness of the resultant surfaces was later analyzed with a surface profilometer. Microphotographs of the machined surfaces were also taken in order to see how effective the air blowing method is. The results of surface roughness measurements were then used to develop a quadratic empirical model for surface finish prediction. Finally, desirability function and genetic algorithms were used to predict the best combination of cutting parameters needed to obtain the lowest surface roughness. The predictions were later tested by experiments. The results demonstrate that this type of machining is viable and the roughness obtained is very low at 0. 049 μm. © (2014) Trans Tech Publications, Switzerland.

Author keywords

Brittle material machining Genetic algorithms Micro-high speed machining Optimization Response surface methodology Surface roughness

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