

Abstract

Micromilling is considered as one of the prominent microfabrication techniques. Even though the process has the advantages of high flexibility and small cycle time, the scarcity of micro cutting tools with adequate strength makes it less popular. Popular tool fabrication techniques like grinding fails to make cheap microcutting tools due to the high scrap rate during tool fabrication. Other techniques like wire electro discharge machining, focused ion beam machining, and laser machining either demands high capital investment or the tool fabrication time is very high. Another challenge in employing micro milling for microfabrication is the formation of microburrs on the machined surface. In this research, a tool fabrication process based on micro electro discharge machining is proposed. A lengthwise tool wear compensation system is developed for increasing the dimensional accuracy of the cutting tool. The process parameters of the tool fabrication process are optimized with the help of a parametric analysis. The machining performance of the fabricated tools is tested by milling microchannels of different workpiece materials. A simultaneous burr removal method is developed for micromilling which makes a burr free machined surface. Finally, an in-situ cutting tool fabrication technique for micromilling is proposed. Different tool geometries are fabricated via the proposed strategy and used for fabricating a passive micromixer device.

Keywords: Micro EDM, micro tools, micromilling, microfluidic devices