

Experimental examinations of machinability of ceramic materials during micro processing

Miloš Pjević^{a,*}, Mihajlo Popović^a, Ljubodrag Tanović^a, Goran Mladenović^a

^a*Faculty of Mechanical Engineering, University of Belgrade*

Abstract

In this paper experimental analyses were conducted in order to determine phenomenon that occurs during micro cutting of brittle material based on the ceramic. In order to investigate interaction between tool and workpiece, diamond tool with tip radius R0.2 was used. Cutting speed of 25 m/s and variable cutting depth were used. Experiments have shown that on the small cutting depths, ductile mode can be achieved. In this region, no evidence of cracks growth in the material was present. Critical penetration depth that represents threshold value of this region was determined. After exceeding critical penetration depth, brittle fracturing occurs. Volume of removed material is much larger than desired one, however smooth surface cannot be achieved. Furthermore, dependence of crack growth from the cutting depth was analyzed. In addition, one of the objectives in this experiment was to determine the changes in the cutting force components (F_n and F_t) in the function of cutting depth. Also, specific cutting energy was determined. Based on the microscopic observation of the machining surfaces, mechanism of micro cutting ceramics was established.

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* Corresponding author. Tel.: /
E-mail address: mpjevic@mas.bg.ac.rs