

The Micro diamond cutting of steel using Electrolysis

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This paper presents a new method that cut steel with diamond tool using electrolysis. The cutting with diamond tool is one of the most important technologies to manufacture precision parts. There are many various applications in the fields of product of optical, electric, and electronic parts such as magnetic disk, polygon mirror, spherical mirror and copier drum, etc.

It is merit to cut a high sharp and precision shape with diamond tool, because it is possible to make edge radius of tool very sharpness. However, conventional diamond cutting method cannot be applied to steel cutting, because there is a excessive wear of the diamond tool due to high chemical activity with iron in high temperature.

So, we intend to apply electrolysis to micro diamond cutting. The basic principle of the cutting method is as follows. The steel workpiece is oxidized continuously by electrolysis in cutting process and the diamond tool cut the layer. The oxidized layer grows along the previous formed shape. We can get the desired shape by the repeats of this work. It is possible to expect the reduction of cutting force, because the diamond tool removes only the weak area by electrolysis. And the reduction of cutting force suppresses excessive wear of diamond tool due to chemical activity with steel. In a simple preparation experiment, the diamond tool maintained the sharpness of tool edge after cut ten 0.3/0.5mm groove on steel(20mm in diameter) with 3 /5micron depth of cut, 1000 rpm of cutting speed.

Key Words: Diamond Tool, Electrolysis