Surface modified tool electrodes for optimized drilling EDM

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Abstract

The production of components for automotive and aerospace industry by conventional manufacturing technologies is still limited by hardness and strength of the workpiece materials. Drilling electrical discharge machining (EDM) is used for machining electrically conductive materials without any limitation due to mechanical properties.

Drilling EDM causes debris in the working gap of the dielectric fluid, which leads to arcs and short circuits on the lateral surface with negative effects on processing results and process duration.

Due to these arcs and short circuits limited drilling depth, increased tool wear, conicity of the bore and process instabilities are still challenges in drilling EDM.

In this work, a new approach for passivation of the tool electrode material by oxidation is shown. Different oxidation processes for tool electrodes made of copper were applied and analysed.

First results show a reduction of the process time by 50 % and of the number of lateral discharges by 20 % for the application of thermal oxidized copper electrodes.

The investigation of different defined oxide layer thicknesses and electrical resistances for specific applications are part of this ongoing work.