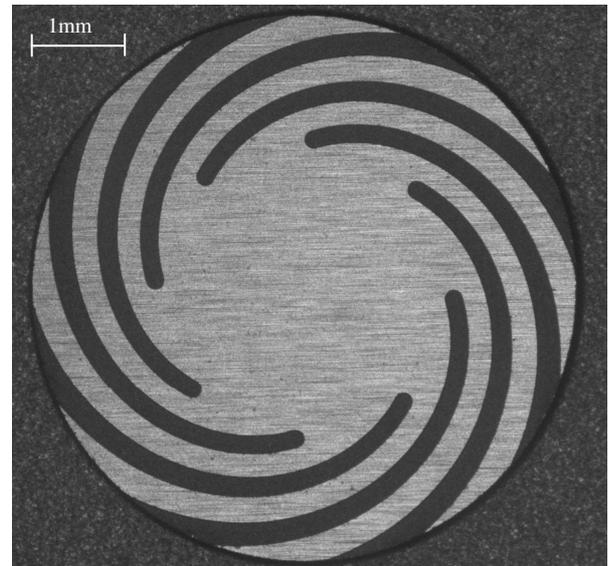


Technical ceramics have received increasing attention in the recent years. Thanks to their high hardness, thermal and chemical stability, low density, wear and oxidation resistance, new concepts for long-live turbo-changers, seals, valves, coatings, high functional surfaces and tools can be developed. Though the great potential, the extensive use of ceramics is still hindered by the high cost associated to the manufacturing of accurate and complex parts without defects. This challenge is even more evident for micro scale applications. With the ambition to improve the efficiency of the current manufacturing chain of advanced ceramic micro components, MicMa³ is undertaking RTD actions in the field of Electrical Discharge Machining (EDM) and High Speed Milling (HSM) of hard and brittle materials. The project has duration of 24 months. During the first year of activities, micro EDM experiments were applied to a selected group of electrical conductive ceramics, including both commercial and own developed solutions, such as TiB₂, alumina and zirconia based ceramic composites, with even enhanced mechanical properties. High competitive

ZrO₂-TiN aerodynamic thrust bearing surface



results could be achieved with respect to surface roughness, down to 0.2 μm of Ra, and machining rate, up to 0.3 mm³/min. As proof of the strategies developed, a ceramic demonstrator in ZrO₂-TiN was fabricated on a SARIX SX-100-HPM micro EDM-milling centre. It is a micro-aerodynamic thrust bearing surface, with a 2-1/2D structure, 6 mm in diameter and geometry similar to a compressor. The grooves are 15 μm deep with a rounded tip, 200 μm in diameter. A layer by layer approach was applied as milling strategy, with incremental depth less than 0.5 μm, and the component fabrication took approximately 40 minutes. A standard WC rod, Ø 0.15 μm, was used as the tool electrode. The geometries of all the grooves showed very good consistency, with tolerance within 2 μm in depth and accuracy less than 0.1 μm at the groove rounded tip. The component is illustrative of the potential applications that can be developed, such as wear resistance moulds and micro machinery components.

Close up view of a groove of the aerodynamic thrust bearing surface

