**Title: The analysis of wear mechanism and the impact of tool geometry in machining Zirconia Dental Crowns**

**Academic lead:** Jason Matthews. Contact: [Jason.Matthews@uwe.ac.uk](mailto:Jason.Matthews@uwe.ac.uk)

With their biocompatible and hypoallergenic properties in combinations with the industry’s movement away from metals in oral applications, zirconia is now becoming widely used in dentistry. Zirconia in its primary form is normally supplied as disc geometries in a pre-sintered form. The manufacturers of dental crowns employ tungsten carbide burrs to machine the disks to the individualised shape of crowns. The machined crowns would then sintered to produce finished products to be used by dentists. The key question which the manufacturers of crowns would like to know is: “how long would a dental burr last”? This question is crucial for manufacturers to calculate cost per crown and also to plan when to stop their machines to change burrs. Worn burrs are detrimental to the final product as they produce poor crown geometry and surface cracks.

In order to address this key question, the project aims to thoroughly investigate the impact of tool geometry to tool life in machining pre-sintered zirconia dental crowns.

The following main areas will be addressed:

* research on characterisation and understanding of the wear behaviour of state-of-the-art tooling (burrs) when machining pre-sintered zirconia.
* research understanding the influence of material removal processes on workpiece surface integrity as well as subsequent dental crown functionality.
* development of a novel tool life relationship for the machining pre-sintered zirconia.
* optimisation of burr design to improve machining efficiency and minimise the wear rates and damage to the crown.