

## **Lattice distortions and residual stresses generated in Yttria-Stabilized Zirconia Ceramics for biomedical applications after surface treatments: effects on mechanical properties and long-term reliability**

The CNRS, INSA Lyon, Claude Bernard Lyon 1 University (UCBL) in Lyon (France) and RMS Foundation in Bettlach (Switzerland) recently collaborated on a project that aimed at characterizing in depth the lattice distortions and residual stresses in Yttria-Stabilized Zirconia Ceramics (Y-TZP) for biomedical applications generated by mechanical modification of their surface (treatments like polishing, grinding and sandblasting). The main objective of the project is understanding the cause and effects of the distortions and relate them to mechanical performances and long term reliability of these ceramics, and it is, therefore, an indispensable contribution to further improve the stability and longevity of Y-TZP implants.

During the first year of the collaboration, a crystallographic model for surface distortions in Yttria-Stabilized Zirconia Ceramics (Y-TZP), based on XRD Rietveld refinement and developed by N. Döbelin, was confirmed with complementary advanced microstructural characterizations. The following step will be to characterize the influence of such distortions on mechanical properties and Low Temperature Degradation (LTD).

In this context, MATEIS laboratory and RMS Foundation are offering a one-year post-doctoral fellowship, with the aim of investigating the effect of surface distortions on mechanical properties and LTD resistance of the materials, as a function of different types and degrees of mechanical surface modifications. The knowledge gained in this project is expected to contribute to improved mechanical stability and degradation resistance of Y-TZP implants.

The objective of this post-doc and second part of the joint work on the subject between the two partners will be:

- to characterize in depth the microstructural and crystallographic alterations of the different surface processing methods (grinding, polishing, sand-blasting) to identify the steps leading to tetragonal to monoclinic phase transformation and tetragonal phase distortions;
- to perform mechanical tests and accelerated aging tests on Y-TZP samples with different types and degrees of distortions and residual stresses, to assess the effect of surface distortions on the mechanical stability and degradation resistance.

The candidate must have in-depth knowledge of microstructural characterization (XRD, Scanning Electron Microscopy, ...) and/or mechanical tests, preferably in ceramics.

The application will be done through an email to Erica Roitero and copy to Jérôme Chevalier and Laurent Gremillard (email addresses below), with a motivation letter and a CV.

Duration: 12 months.

Location: MATEIS laboratory (INSA Lyon, Lyon, France).

Deadline: a first selection will be conducted based on the applications already received on 07/05/2026.

### Contact @ MATEIS :

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