

# Title: PREPARATION TECHNIQUE OF PARTIALLY STABILIZED ZIRCONIA CERAMICS BY THE OXIDES ADDITION

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## Abstract

The novel of invention relates to a preparation technique of new ceramic materials based on partially stabilized zirconia with other oxides after sintering at room temperature. This technique combines the sintering method used in ceramics with the melt quenching method used in glasses and implies a high temperature solid state reaction process. By using oxides and carbonates as starting materials in the presented procedure, high purity ceramic products will be obtained – a requirement solicited by the medical field. The analysis of X-ray diffractions data shows that the invented ceramics noted with PI1 and PI2 have two main phases, namely cubic zirconia (c-ZrO<sub>2</sub>) and tetragonal zirconia (t-ZrO<sub>2</sub>) phases. The formation of tetragonal or/and cubic zirconia crystalline phases is highly desirable in technological and medical applications while the monoclinic zirconia (m-ZrO<sub>2</sub>) phase has limited applications due to the volume expansion which yields micro-cracking and the mechanical instability in the ceramic. These high temperature zirconia crystalline phases were also detected in the commercial brands (BC1, BC2 and BC3) used for the dental applications.



## PURPOSE

- i) synthesis of new zirconia ceramics (PI1, PI2) in order to minimize costs and to improve dental aesthetics; ii) stabilization of high temperature zirconia phases.

## DESCRIPTION

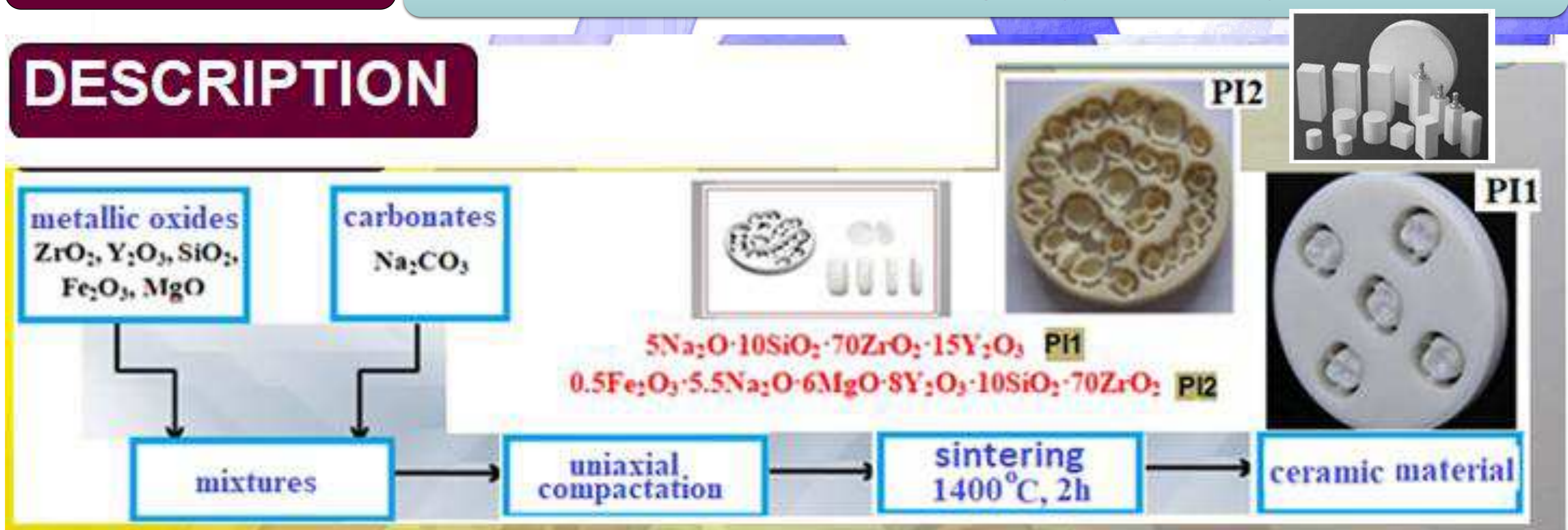


Figure 1: Preparation scheme of the ceramic materials.

## ADVANTAGES

- The analysis of X-ray patterns illustrated in the Figure 2 shows that: i) the invented ceramics (noted as PI1, PI2) have the diffraction peaks corresponding to the ZrO<sub>2</sub> (zirconia) phase stabilized at the cubic (c) / tetragonal (t) structure; ii) in the commercial brands (noted as BC1, BC2, BC3) used for dental technique were also detected tetragonal ZrO<sub>2</sub> and/or cubic ZrO<sub>2</sub> phases and small amounts of monoclinic ZrO<sub>2</sub> phase (for the samples BC2 and BC3);
- The absence of monoclinic ZrO<sub>2</sub> phase (responsible of micro-cracking of the material) in the PI1, PI2 and BC1 samples;
- The change of color of the ceramic by the adding of Fe<sub>2</sub>O<sub>3</sub> contents (white → cream);

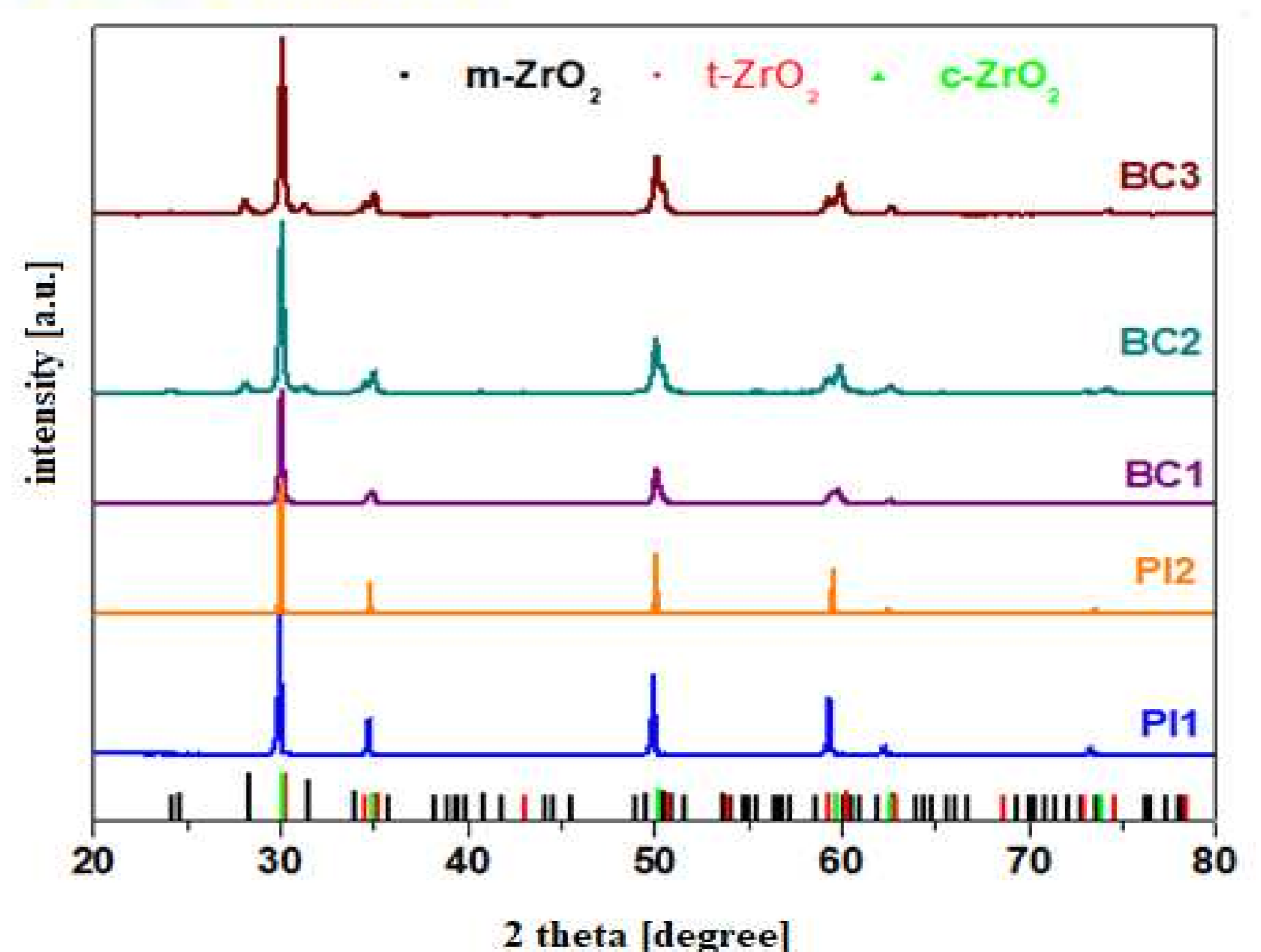


Figure 2: X-ray diffraction patterns of the prepared ceramics (PI1, PI2) and comercial ceramics (BC1, BC2).