

## Conference Abstract

**Hydrothermal ageing study on two step sintered 3Y-TZP ceramic**

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**Abstract**

In this study, Hydrothermal ageing resistance of two step sintered 3 mol. % Yittria stabilized tetragonal zirconia polycrystalline (3Y-TZP) ceramic was analysed. 3Y-TZP ceramic powder was die pressed followed by cold isostatic pressing. Then the compacts were sintered by using Two-Step Sintering (TSS) technique. The first step sintering involved, heating the samples to a temperature ( $T_1$ ) at a heating rate of  $10^\circ\text{C}/\text{min}$  and holding the samples at this temperature for one minute then the samples were cooled to second step sintering temperature ( $T_2$ ) at a cooling rate  $10^\circ\text{C}/\text{min}$  and held at that temperature for two hours. Samples were sintered using tube furnace for nine different sintering profiles. Sintering profile is shown in the Table.

Table: Sintering Profile

Sample ID	First step sintering Temperature ( $T_1$ ) ( $^\circ\text{C}$ )	Second step sintering Temperature ( $T_2$ ) ( $^\circ\text{C}$ )
1	1500	1100
2	1500	1200
3	1500	1300
4	1450	1100
5	1450	1200
6	1450	1300
7	1400	1100
8	1400	1200
9	1400	1300

The Hydrothermal ageing process was carried out in an autoclave with superheated water steam at  $180^\circ\text{C}$  and 10 bar for different period of time to assess the ageing resistance of 3Y-TZP ceramics. The ageing process was held for 2h, 7h, 15h, 23h, 48h, 72h, 96h and 144h. The phase analysis of the sintered samples was recorded by X-ray Diffraction (XRD). The sample sintered with first step sintering temperature  $1450^\circ\text{C}$  and below did not exhibited any phase transformation even after 100 hours of ageing. Samples sintered at  $1500^\circ\text{C}$  are more responsive to hydrothermal ageing. Our study reveals that  $1450^\circ\text{C}$  would be the best first step sintering temperature to get better hydrothermal ageing resistance.

**Keywords:** 3Y-TZP, Ageing, Two-step sintering

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