

## **Mechanical properties of ZTA composite using cold isostatic pressing and uniaxial pressing**

### **Abstract**

Alumina-zirconia composite is an engineering material with a great potential to be developed for application as high temperature resistance structural material. In this research, zirconia toughened alumina (ZTA) was produced by physical interaction between Al<sub>2</sub>O<sub>3</sub> powder and Y<sub>2</sub>O<sub>3</sub>-ZrO<sub>2</sub> powder. Two compositions of powder with different Al<sub>2</sub>O<sub>3</sub>: Y<sub>2</sub>O<sub>3</sub>-ZrO<sub>2</sub> ratio were used, 70:30 and 80:20 by weight. Two different compaction methods, i.e. uniaxial pressing and cold isostatic pressing (CIP) with a maximum load of 150 MPa were used in this research to investigate the differences in properties of composites. Sintering process was done at four different temperatures with the heating rate is 5 °C/ min with a soaking time of five hours. Mechanical testing, i.e. compressive strength and hardness was performed to all samples. The microstructure analysis using a Scanning Electron Microscope SEM was also studied. From the result, the composite with the ratio of 70:30 showed better mechanical properties as compared to 80:20 composite. Addition of zirconia in the composite gave an increase in toughness due to transformation toughening mechanism of tetragonal to monoclinic phase. As a conclusion the composites produced high compaction green density will improve the sintering process, resulting in improved mechanical properties.

### **Keywords**

Cold isostatic pressing; Uniaxial pressing; Zirconia-alumina composite