Thermal Shock Resistance of Oxygen Sensors

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Oxygen sensors are used to determine the correct air to fuel ratio, with the ability to increase fuel efficiency and lower carbon emissions. However, these sensors must undergo huge changes in temperature fluctuations causing reduced longevity and frequent failure. This project deals with increasing the thermal shock resistance of YSZ (Yttria Stabilized Zirconia) which is the principle component of oxygen sensors. In addition to the YSZ, other materials will be mixed in various quantities to increase its strength and thermal shock resistance. Tests were conducted in accordance to ASTM guidelines and results showed improvements. Using Finite Element Analysis software, OOF2, the microstructure of the ceramic was then modeled to help better predict its behavior and failure.