**Significant effect of rice husk and sugarcane bagasse pore formers on the microstructure and mechanical properties of porous Al2O3/Ni composites**

## ABSTRACT

Porous alumina systems are suitable for application in wide-ranging industrial processes that require extreme service conditions such as high temperatures and corrosive mediums due to their remarkable thermal and chemical stability. Given the inherent brittleness of ceramics and their high sensitivity to thermo-mechanical loading, large-scale production of porous alumina components is constrained. In this study, the reinforcement of porous alumina ceramics with nickel (Ni) particles has been reported. Plain and Ni-reinforced porous alumina ceramics were developed through the powder metallurgy method with agro-waste materials from rice husk (RH) and sugarcane bagasse (SCB) as the pore-forming agents (PFAs). Experimental results showed that the formation of a stable Ni3Al2SiO8 spinelloid phase in the RH-graded composites actuated the emergence of a relatively refined microstructure while on the other hand, microstructural defects such as dislocated grains and localized voids were observed for the SCB-graded counterparts due to the presence of poorly crystallized NiAl2O4 spinel phase. Generally from the mechanical strength characterization, an inverse relationship was established between the mechanical properties and Ni reinforcement which agrees well with the Griffith's model. Moreover, the strengthening effect of the Ni3Al2SiO8 spinelloid phase was well marked in the RH-graded composites as maximum hardness, tensile and compressive strengths of 167.3HV, 12.6 MPa and 55.3 MPa respectively were achieved for the composite reinforced with 2 wt% Ni.

**Keyword**: Porous alumina; Composites; Agro-waste PFA; Porosity; Mechanical properties