

Preparation and characterisation of porous alumina ceramics using different pore agents

ABSTRACT

Graphite waste from primary batteries, active yeast and commercial rice husk ash have been used as pore-forming agents to fabricate porous alumina ceramics using a fugitive materials technique. The pore-forming agent ratios were between 10 to 50 wt %. The effects of the pore-forming agent ratios on the mechanical properties, the porosity and the microstructure have been investigated in this study. The results showed that through increasing the pore-forming agent ratio for graphite waste, yeast and rice husk ash, the porosity increased from 37.3 to 61.1%, 30.2 to 63.8% and 42.9 to 49.0%, respectively. The hardness also decreased from 172.6 to 38.1 HV1 and from 160.6 to 15.0 HV1 for porous alumina ceramics using graphite waste and yeast as pore-forming agents, respectively. However, the hardness of the porous alumina ceramics with rice husk ash as a pore-forming agent increased at 30 wt % (150.9 HV1) and 50 wt % (158.9 HV1). The tensile strength for porous alumina ceramics using graphite waste and yeast as pore-forming agents decreased from 24.9 to 14.3 MPa and from 26.2 to 5.4 MPa. The compressive strength decreased from 112.3 to 34.3 MPa and from 19.5 to 1.8 MPa, respectively. However, for porous alumina ceramics using rice husk ash, the tensile strength increased at 30 wt % (24.1 MPa) and 50 wt % (21.9 MPa). The compressive strength also increased at 30 wt % (69.7 MPa) and at 50% (60.1 MPa).

Keyword: Porous ceramics; Graphite waste; Yeast; Rice husk ash; Porosity; Mechanical properties