Agro-waste shaped porous Al2O3/Ni composites: Corrosion resistance performance and artificial neural network modelling

ABSTRACT

In the present study, an analysis on the combined effect of nickel (Ni) reinforcement and pore former type in characterizing the corrosion behavior of composite porous alumina ceramics was performed. In order to showcase the potential of the new porous ceramics, pore-forming agents (PFAs) from rice husk (RH) and sugarcane bagasse (SCB) were used in shaping the plain and composite porous alumina samples having sample formulation of Al2O3-xNi-PFA; x = 0, 2, 4, 6 and 8 wt%. Results showed that the emergence of a highly stable Ni3Al2SiO8 spinelloid phase in the RH-graded composites enhanced their chemical stability in the corrosive mediums (10 wt% NaOH and 20 wt% H2SO4) relative to the plain and the corresponding SCB-graded counterparts. An artificial neural network (ANN) model has been developed for predicting the corrosion behavior of the plain and composite porous alumina ceramics based on the experimental data. The developed ANN model satisfactorily predicted the percent mass losses of the porous ceramics in strong alkali and strong acid solutions with coefficient of determination (R2) of approximately 0.99.

Keyword: Porous alumina; Composites; Agro-waste PFA; Corrosion resistance; ANN modelling