A novel fabrication method for TiC Al₂O₃ Fe functional material under centrifugal acceleration

Reza Mahmoodian, M.A. Hassan, R.G. Rahbari, R. Yahya, M. Hamdi

Abstract:

Compacted powders of titanium (Ti) and carbon (C) in form of pellets were exposed to a massive amount of heat generated from the thermite reaction of Fe₂O₃ and Al in a graphite-steel tube mounted in a developed centrifugal accelerator machine. The centrifugal force facilitated the formation of multi-component products during the process. Titanium carbide (TiC) product is joined to an Al₂O₃-Fe layer, which are the products of the thermite reaction. The existence of centrifugal acceleration had a significant effect on both metallurgical alloying and mechanical interlocking between different layers of the sample to form a functional material. A mathematical model developed for this experiment to describe the speed rate of iron infiltration inside the TiC product as well as viscosity rate variation was presented. The composition, microstructure and mechanical properties confirmed the model.

Keywords:

A. Ceramic-matrix composites (CMCs); B. Microstructures; C. Computational modeling; E. Joints/joining; Combustion synthesis

Published In:

Composites Part B: Engineering, Vol.50, PP.187-192