Investigation on the electrical conductivity of Al2O3-Ti ceramiccomposites using a pressureless sintering process

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ABSTRACT

Ceramics have been considered one of the important materials due to its resistance to high temperature and high hardness. However, the brittleness and low electrical conductivity properties affected the wide use of it in different applications. For example, the insulating, dielectric or low conductive ceramic property makes it difficult to be machined to the required shape and complexity using the non-conventional electrical discharge machining (EDM). The electrical conductivity of the ceramics can be improved by the addition of conductive metallic particles so that its microstructural property would be modified. Hence, the electrical conductivity of ceramic matrix composite of Alumina reinforced with Titanium (Al2O3/Ti) with different weight (w) percentage (%), powder compacted and sintered, was investigated for possible electrical conductivity improvement. A new insight on the microstructural-process interaction for the improved conductivity was established. The Al2O3/Ti ceramics was observed improving its electrical conductivity as the weight percentage (wt%) of Ti increases. The increase in the electrical conductivity is mainly attributed to the formation of interconnected Ti phases within the alumina matrix after sintering. The electrical conductivity sintered at 1700 C with 20 wt% exhibit highest improvement in electrical conductivity of 2.265^-4 S/cm compared to pure of Al2O3.

KEYWORDS: Alumina; Composite; Electrical conductivity; Microstructure; Titanium; Pressureless sintering

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