MICROWAVE DIELECTRIC PROPERTIES OF OPEN-CELL SOLID FOAMS BASED ON SILICON CARBIDE CERAMICS

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Open-cell porous materials are abundant in industrial applications and are used for example as heat exchangers, thermal insulators, reaction catalysts, flow stabilizers, mass transfer enhancers, solar radiation absorbers and electrical heaters, etc. [1]. In recent years, the interest in solid foams based on silicon carbide "SiC" has regained popularity. Nevertheless, when applied to microwave applications there is a lack of reported properties. The key indicator of how a material interacts and is heated with microwaves is the "permittivity", which is best described in a complex form. The aim of this work is to improve the database of complex permittivity of open-cell solid foams based on silicon carbide, which was determined using the cavity perturbation method [2]. Temperature dependent measurements of permittivity were performed in the range of 30 °C to 190 °C for three different foam materials, i.e. silicon infiltrated silicon carbide (SiSiC), pressureless sintered silicon carbide (SSiC) and silicate-bounded silicon carbide (SBSiC), with porosities in the range of 86.9 % to 96.5 % and pore size of 30 ppi (pore per inch), 45 ppi and 60 ppi.

As a result, a model based on mixture rules was developed that well predicts the permittivity as a function of porosity.

References

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