

282. Title: Terahertz dielectric properties of plasma-sprayed thermal-barrier coatings
Authors: Watanabe, Makoto (1); Kuroda, Seiji (1); Yamawaki, Hisashi (2); Shiwa, Mitsuharu (2)
Source title: Surface and Coatings Technology
Volume: 205
Issue: 19
Issue date: 25 June 2011
Publication year: 2011
Pages: 4620-4626
Language: English
Document type: Journal article (JA)

Abstract: We investigated the electromagnetic wave transmittance and dielectric properties of yttria partially stabilised zirconia thermal-barrier coatings by terahertz time-domain spectroscopy in which the samples were irradiated by a pulsed THz wave in the frequency range of 0.1-6.3 THz. The coating microstructure was varied by changing the spray conditions and the THz transmittance and dielectric constants were examined as functions of frequency. The coatings exhibited a high transmittance of 20%-80% at frequencies below 0.5 THz and almost zero transmittance above 1.5 THz. The refractive index n for different coatings ranges from 4 to 6, depending on the coating microstructure. For any given coating, n increases to some extent with increasing frequency. Unlike the imaginary part of the dielectric constant, the real part of the dielectric constant is strongly correlated with the porosity of the coatings, which suggests that terahertz spectroscopy may potentially be used to non-destructively evaluate the porosity of ceramic coatings.