DETERMINATION OF THE RADIATION CHARACTERISTICS OF RETICULATE POROUS CERAMICS BY EXPERIMENTAL SPECTROSCOPY AND TOMOGRAPHY-BASED MONTE CARLO

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ABSTRACT. The effective extinction coefficient of reticulate porous ceramics (RPC) is determined experimentally using a spectroscopy measurement system for the spectral range 0.3–4 μm. The value obtained is independent of wavelength as predicted by the geometric optics, and compares well with the one obtained numerically by applying a tomography-based Monte Carlo ray tracing on the exact 3D digital representation of the RPC's complex geometry. The latter methodology is further applied to determine the scattering phase function, which is then compared to those for specularly and diffusely reflecting large opaque spheres. RPCs with reflecting coatings exhibit predominantly backward scattering, while those with highly-absorbing and specularly-reflecting coatings augment forward scattering. The difference between the experimental and numerical results is attributed to local anisotropy, which affects the experimental measurements carried out along a single direction.