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# DEPENDENT SCATTERING IN SILICA AMBIGEL MONOLITHS – EXPERIMENTS AND SIMULATIONS

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ABSTRACT. This study demonstrates experimentally and numerically that dependent scattering plays an important role in light transfer through aerogel monoliths and contributes to their transparency. Dependent scattering among an ensemble of particles refers to the situation when the average interparticle distance is small compared to the incident wavelength. Then, the radiation characteristics of particle ensembles depend not only on their volume fraction but also on their specific spatial arrangements. Rigorously accounting for dependent scattering in aerogels requires solving Maxwell's equations but is limited to relatively thin samples. Here, we use the recently developed Radiative Transfer with Reciprocal Transactions ($R^2T^2$) method to predict the normal-hemispherical transmittance of thick plane-parallel slabs of aerogels. The radiation characteristics of a large number of aggregated particle ensembles were estimated using the superposition T-matrix method and the radiative transfer equation (RTE) was solved stochastically using Monte Carlo method combined with strategies for sampling the previously computed radiation characteristics. Evidences of dependent scattering were observed in the experimental measurements of the normal-hemispherical transmittance of ambiently dried silica aerogel monoliths with porosities ranging from 70% to 90%. Experimental measurements agreed very well with numerical predictions from the $R^2T^2$ method but differed significantly from predictions obtained by solving the RTE assuming independent scattering for all porosities considered.