

**BAYESIAN PARAMETER ESTIMATION OF POROUS
MATERIALS**

By

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This research work proposes a new application of Bayesian analysis to determine the physical parameters of a rigid frame porous material from the measurement of the material's acoustic impedance. Impedance measurements of a sample material have been acquired using the collection of impedance tubes available in the acoustics laboratory at Rensselaer Polytechnic Institute. The use of multiple impedance tubes of different sizes allows for a determination of the sample's complex impedance over a much larger frequency range than previous studies. A comparison of this measured data to results obtained from various existing models of porous materials allows for an analysis of the limitations of each model, which leads to reductions in the dimension of the parameter space for a given parameter over a certain frequency range. Bayesian analysis allows for numerical estimation of physical parameters, their uncertainties, and interrelationship of the material from the measured complex impedance.