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**Elena Cherkaev\*** ([elena@math.utah.edu](mailto:elena@math.utah.edu)), University of Utah, Dept. Mathematics, 155 S. 1400 E., JWB 233, Salt Lake City, UT 84112. *Can One Hear the Structure of a Composite?*

Spectral representation of the effective properties of an anisotropic composite material results in a Stieltjes function with a matrix valued measure. This spectral measure in the Stieltjes integral representation contains all information about the microstructure of the composite and can be uniquely recovered from effective measurements known in an interval of frequency. We discuss applications to forward and inverse homogenization, in particular, we show that matrix Pade approximants provide an efficient way to construct spectrally closely matched microstructures. (Received July 19, 2016)