Anisotropy and sound propagation in glass wool

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Sound propagation in glass wool is studied theoretically and experimentally. Theoretical computation of attenuation and phase velocity for plane, harmonic waves will be presented. Glass wool is a highly anisotropic material, and sound waves propagating in different directions in the material will be considered. The computations are based on the geometry of the glass wool that is described by the density of fibers and their diameters. The air drags viscously on the fibers, and movements of the fiber skeleton are important at low frequencies. Propagation of elastic waves in the skeleton is computed by regarding it as a continuous medium described by its elastic moduli and mass density. The computed attenuation of sound waves, for frequencies 50–5000 Hz, will be compared with experimental results for glass wool with fiber diameters of 6.8 micrometers, mass density of 15 and 30 kg/m³, and elastic moduli of 2000 and 16 000 Pa (sound wave vector perpendicular to fibers).

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