Effect of Compression on the Transmission Loss of Porous Material

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Porous materials are commonly applied in sound absorption in different places. Transmission loss, one of the vital parameters determining the performance of the material, will change when the material is compressed. Usually the compression that might affect the properties to the greatest extent are normal compression and the deformation can be simplified as 1D compression model. In order to verify the prediction, some formulas taking several parameters (porosity, tortuosity, flow resistivity and characteristic lengths) into account are applied and also the Johnson et al's model of limp structure. Dynamic density of limp model and bulk modulus are thus obtained and to get the mathematical expression of the transmission coefficient and transmission loss, acoustic equations including Euler equation are applied to the boundary conditions between the material and the fluid (air in the experiment). The numerical predictions are later compared with experimental data collected with 4-mic 2-load measurement on Kundt standard impedance tube. Both the mathematical prediction and the experimental results shows that the transmission loss would decrease under compression and increase if the material is extended.