A formalism to couple any visco-inertial models to structural ones in Biot's theory

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Poroelastic material performances used in sound packages rely on dissipative effects related to fluid motion in the pores combined to structural deformation associated to the porous skeleton deformation. On this basis Biot proposed an interaction formalism to account for these coupled phenomena. Actually, the main assumption of Biot's approach is that the dissipation in the fluid is independent of the dissipation in the skeleton. The present work proposes to examine deeper this assumption for the modeling and the design of advanced noise control solutions.
A generalised approach is proposed here to account for the elastic effects with any type of model to represent the visco-thermal dissipation in the fluid phase. This approach allows to select the model according to the material morphology or the information available about the material. On top of these " fluid " models, the elastic effects, so-called Biot effects, can be integrated to model accurately the interaction with elastic structures or other adjacent poroelastic materials in multi-layer systems. This approach further allows to include elastic effects in models for elaborated materials like double porosity or porous composites which so far assumed a rigid porous frame. These latter materials were indeed proved to present increased performances at low frequencies for both sound absorption and transmission.
This approach, implemented in a transfer matrix algorithm, is validated against experimental data of sound absorption and transmission obtained for four material arrangements enduring structural deformation : a poro-elastic porous material model with Delany\&Bazley empirical model (Allard book (1993), Fig. 5.15 p108), a porous screen with a backing air gap, a double porosity material and a porous composite.

Oral presentation preferred.

No special requirements.

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