

COMPRESSIBILITY MODULI FOR POROUS MATERIALS

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Here we examine typical experiments performed on saturated porous materials (swelling and non-swelling) such as visco-elastic polymers, soils, bones, and biomaterials, and relate them to thermodynamic quantities. Compressibility experiments typically take a porous material sample and control two of the following four parameters: electro-chemical potential (or pressure for a non-swelling porous material) of the liquid phase, pressure of the sample, volume of the sample, and mass of liquid leaving the porous material. The other two variables are measured at equilibrium. In this talk the results of a thermodynamic analysis (with no constitutive assumptions) are presented for non-swelling and swelling porous materials. The theory relates thermodynamic quantities (such as the compressibility of each phase and difference in the solid and liquid phase pressures) to what is practically measurable via compressibility experiments. Because minimal assumptions are made the results are applicable to modeling wave propagation or deformation of swelling and nonswelling porous materials.

Keywords: porous media, compressibility, polymers, soils