

13.2: Compression

The way in which the volume of a material decreases with pressure at constant temperature is described by the *isothermal compressibility*, κ :

$$\kappa = -\frac{1}{V} \left(\frac{\partial V}{\partial P} \right)_T. \quad (13.2.1)$$

Note the necessary minus sign.

Later, we shall need to distinguish between “isothermal compressibility” and “adiabatic compressibility”, and we shall need a subscript to the symbol κ in order to distinguish between the two. For the time being, however, κ with no subscript will be taken to mean the isothermal compressibility.

The reciprocal of κ is called the isothermal *bulk modulus*, sometimes (understandably) called the isothermal *incompressibility*.

Question: What are the SI units for compressibility and bulk modulus?

Exercise: Show that the isothermal compressibility of an ideal gas is $1/P$.

Exercise: What is the bulk modulus of air at atmospheric pressure?

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