coefficient of thermal expansion using the equation of state for an ideal gas

none

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Abstract

Generated by the Physics Derivation Graph. https://notendur.hi.is/hj/EE2/HD1lausn.pdf

Eq. 1 is an initial equation.

$$\alpha = \frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p \tag{1}$$

Eq. 2 is an initial equation.

$$V = \frac{nRT}{P} \tag{2}$$

Substitute LHS of Eq. 2 into Eq. 1; yields Eq. 3.

$$\alpha = \frac{1}{V}\frac{nR}{P}\left(\frac{\partial T}{\partial T}\right)_P \tag{3}$$

Simplify Eq. 3; yields Eq. 4.

$$\alpha = \frac{nR}{VP} \tag{4}$$

Eq. 5 is an initial equation.

$$PV = nRT \tag{5}$$

Divide both sides of Eq. 5 by T; yields Eq. 6.

$$\frac{PV}{T} = nR \tag{6}$$

Substitute RHS of Eq. 6 into Eq. 4; yields Eq. 7.

$$\alpha = \frac{PV}{T}\frac{1}{VP} \tag{7}$$

Simplify Eq. 7; yields Eq. 8.

$$\alpha = \frac{1}{T} \tag{8}$$

Eq. 8 is one of the final equations.

References