

10.40 Thermodynamics  
Problem Set 4

Fall 2003

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 Problem 6.2 Text
 

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**Solution:**

Since the total volume, temperature, and mass are fixed, the criterion for equilibrium is:

$$d\underline{A} \geq 0$$

$$d\underline{A} = d\underline{A}^V + d\underline{A}^L = -P^V d\underline{V}^V - P^L d\underline{V}^L + \mu_A^V dN^V + \mu^L dN^L$$

with

$$d\underline{V}^V + d\underline{V}^L = 0$$

$$dN^V + dN^L = 0$$

thus,

$$d\underline{A} = -(P^V - P^L)d\underline{V}^V + (\mu^V - \mu^L)dN^V \geq 0$$

and the equilibrium criteria are:

$$P^V = P^L$$

$$\mu^V = \mu^L$$


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