1. For the case of spontaneous freezing, at constant pressure of 1 atm., of 1 mole super-cooled liquid silver initially at 900 C in an adiabatic container, calculate :
2. Amount of silver that solidifies
3. Entropy change for this process.

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Assume: Cp(Ag,l ) =30.5 J/mol/K, Cp(Ag, s )=31.5 J/mol/K.

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**Solution:**

Let x moles solidify.

Since this is a constant pressure process, the enthalpy remains constant during adiabatic solidification. Enthalpy being state function we can follow any path.

Let the entire liquid be heated to the melting point, and then x moles solidify at this temperature. Then :

ΔH = Therefore x = 30.5(1234-1173)/11240) = 0.1655:fraction solidified. [ Since this is the division of two extensive properties, x remains the same irrespective of the amount of material]

Since the solidification at the melting point is reversible, and heating can also be made reversible:

ΔS =

= 30.5 ln (1234/1173) + 0.1655(-11240)/1234 = 1.596 - 1.5576 = 0.003843 J/K

Positive therefore feasible.