

Tutorial

Second Law of Thermodynamics

Super-cooled liquid silver is kept at 1 atm., in an adiabatic container. Assume that part of the silver solidifies and the temperature increase. The following three situations are hypothesized:

(i) Starting from 900 C, on partial freezing the temperatures reaches 955 C.

(ii) Starting from 900 C, on partial freezing the temperatures reaches 960 C.

(iii) Starting from 900 C, on partial freezing the temperatures reaches 965C.

In each case calculate the fraction solidified and entropy change in each case. Comment on the change in entropy in going from 900 to 955, 955 to 960 and then 960 to 965 and based on this comment on the feasibility of three processes mentioned.

The melting point of silver is 960C and enthalpy of fusion is 11240 J/mol. (

Assume: $C_p(\text{Ag}, l) = 30.500 \text{ J/mol/K}$, $C_p(\text{Ag}, s) = 31.800 \text{ J/mol/K}$.

[Perform calculations with at least 5 significant digits to discern the differences]

$$S_2 - S_1 = \int_{\{T_1\}}^{\{T_2\}} \frac{C_p}{T} dT$$

During melting

$$\Delta S = \frac{\Delta H}{T_m} \text{ where } T_m \text{ is melting point.}$$