

homework #1

1. Calculate enthalpy of pure aluminum at 1300°C.

Plot enthalpy vs. temperature for Al in the temperature range from 25°C to 1300°C. In the plot show the values of melting temperature and the values of enthalpies at $T = 25^\circ\text{C}$ and $T = 1300^\circ\text{C}$.

If you are drawing your plot by hand, please use a realistic scale for both axes.

2. Calculate enthalpy of Al_2O_3 at 3000 K. Assume a temperature-independent heat capacity in the liquid phase, $c_p^{\text{liquid}} = 192.5 \text{ J/mol K}$.

3. Calculate heat of formation of Al_2O_3 (the enthalpy change for oxidation reaction $2\text{Al} + 3/2 \text{O}_2 = \text{Al}_2\text{O}_3$) at 1573 K.

4. An absent-minded cook left a pot with water on a hot stove. There are 4 liters of water in the pot and the stove supplies about 1 kJ/s to the water. When the cook left the kitchen, the water was at 50°C. How long it will take before all the water will be gone from the pot? Latent heat of vaporization of water is $\Delta H_v = 2260 \text{ kJ/kg}$. You can assume a temperature-independent heat capacity of liquid water, $C_p = 4.184 \text{ J/g K}$.

You can use thermodynamic/thermochemical data given in tables at the end of the book by Gaskell or any other *reliable and accessible* source). Please give all the data and formulas used in calculations as well as references to the source of data.