

Chapter 8 – Practice FRQ

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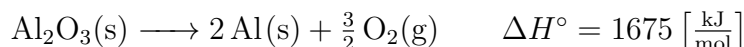
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1. Aluminum metal can be recycled from scrap metal by melting the metal to evaporate impurities.

- (a) Calculate the amount of heat needed to purify 1[mol] of Al originally at 298[K] by melting it. The melting point of Al is 933[K]. The molar heat capacity of Al is $24 \left[\frac{\text{J}}{\text{molK}} \right]$, and the heat of fusion of Al is $10.7 \left[\frac{\text{kJ}}{\text{mol}} \right]$

$$\begin{aligned} Q &= cm\Delta T \\ 24 \cdot 1 \cdot (933 - 298) &= 15240[\text{J}] \\ 15.42 + 10.7 &= 25.94[\text{kJ}] \end{aligned} \tag{1}$$

- (b) The equation for the overall process of extracting Al from Al_2O_3 is shown below. Which requires less energy, recycling existing Al or extracting Al from Al_2O_3 ? Justify your answer with a calculation.



$$\begin{aligned} .5 \cdot 1675 &= 837.5[\text{kJ}] \\ 837.5 &> 25.94 \end{aligned} \tag{2}$$

\therefore It makes more sense to recycle