

## Answer on Question #60815, Chemistry / General Chemistry

**Conditions:** the south pole of mars is covered with dry ice, which partly sublimates during the summer. The CO<sub>2</sub> vapor recondenses in the winter when the temperature drops to 150K. Given that the heat of sublimation of CO<sub>2</sub> is 25.9kJ/mol, calculate the atmospheric pressure on the surface of mars.

The same type of equation used for determination of heats of vaporizations applies to heats of sublimation. The South Pole of Mars is covered with dry ice, which partially sublimates during the summer. The CO<sub>2</sub> vapor recondenses in the winter when the temperature drops to 150 K. Given that the heat of sublimation of CO<sub>2</sub> is 25.9 kJ/mole, calculate the atmospheric pressure on the surface of Mars if the normal sublimation temperature of dry ice is -75C. Show all work clearly for full credit.

$$H_s(\text{CO}_2) = 25.9 \text{ kJ/mol}$$

$$T_{1\text{subl}}(\text{CO}_2) = -75^\circ\text{C} = 273.15 - 78.5 = 198.15 \text{ K}$$

$$T_2 = 150 \text{ K}$$

P-?

$$\Delta T = 198.15 - 150 = 48.15 \text{ (K)}$$

Here  $V_1 = V_2$

Clausius - Clapeyron in differential form is written:

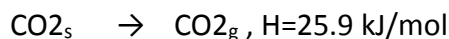
$$dP / dT = P * \Delta H_{f.p.} / RT^2$$

or

$$\ln(P_2/P_1) = \Delta H_{f.p.} * (T_2 - T_1) / RT_2 T_1$$

$$\ln(P_2/P_1) = 25.9 \text{ kJ/mol} * (48.15 \text{ K}) / (8.31 \text{ (kJ/mol} * \text{K)}) * 198.15 \text{ K} * 150 \text{ K} = 0.005$$

$$P_2/P_1 = e^{0.005} = 1.049 \text{ (times)}$$



$$P(\text{Mars}) = 0.7 - 1.155 \text{ kPa}$$

$$\text{Here of } 1.155 * 1.049 = 1.21 \text{ kPa}$$

**Answer:** the atmospheric pressure on the surface of mars 1.21kPa