Answer on Question #60815, Chemistry / General Chemistry

Conditions: the south pole of mars is covered with dry ice, which partly sublimes during the summer.The CO2 vapor recondenses in the winter when the temperature drops to 150k. Given that the heat sublimation of CO2 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 sublimes during the summer. The CO2 vapor recondenses in the winter when the temperature drops to 150 K. Given that the heat of sublimation of CO2 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.

$H_s(CO2)$= 25.9kJ/mol

$T1_{subl}(CO2)$= -75C =273.15-78.5=198.15K

T_2=150K

P-?

ΔT=198.15-150=48.15(K)

Here V1=V2

Clausius - Clapeyron in differential form is written:
dP / dT = P * ΔHf.p. / RT2

or

$\ln(P_2/P_1) = \Delta H_{ф.п}*(T_2 - T_1) / RT_2T_1$

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

$P2/P1=e^{0.005}$=1.049(times)

$CO2_s \rightarrow CO2_g$, H=25.9 kJ/mol

P(Mars)= 0,7-1,155kPa

Here of 1.155*1.049(t)=1.21kPa

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