

# Sublimation Values of Ice Under Lunar Conditions Luke A. Wanner Mentor: Dr. David Freistroffer

### Overview

- This study and proposed experiment were simulate the conditions of the moon and p effect those conditions would have on the of ice.
- The hypothesized values for the heat of su and the energy of sublimation would be to controlled environment designed to simul conditions.

### Introduction

- Sublimation is the process by which a substance from a solid state to a gaseous state.
- Sublimation of a substance is affected by two diff factors: pressure and temperature. This relationsh described by the *Clausius-clapeyron equation*:

$$ln(\frac{P}{P_0}) = \frac{\Delta H_{sub}}{R} (\frac{1}{T_0} - \frac{1}{T})$$

• Graphing this Equation near the values of the mo following plot:



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	Calculation
e designed to predict the sublimation ublimation	<ul> <li>Using the initial pressure of 3e-13 ice on the moon is calculated to be</li> <li>The heat equation can be used to fis sublimating 1 kg of ice:</li> <li>ΔH = mCΔT</li> </ul>
late lunar	• Using the initial temperature of 40 the energy required to sublimate 1 is roughly 169.1 kJ.
	Setup
transitions	• A high power vacuum pump was u
fferent hip is	<ul> <li>A refrigeration bath was used to get</li> <li>The ice that was sublimated was key a vacuum-rated sealed flask that w bath.</li> </ul>
oon gives the	• A separate flask was used to collect was connected to the ice chamber (was placed in a -79°C dry ice/aceto

kPa and the temperature of around 121 K or -152 °C. find the energy of

)K, it can be calculated that kg of ice on the moon

### used to get below 0.612 kPa.

et as low as -27 °C.

ept in vas set inside the

ct the sublimated ice and (See Figure 5). This flask one bath in a thermos.



### Procedure

- the calculated values for sublimation.

### Results

- 121 K or -152 °C.
- kJ/kg.
- calculated values.

### Conclusion

- sublimate the ice.



• In the proposed experiment, this setup would be used to test

• To test these values, the temperature and pressure are varied and recorded at different points of sublimation.

• This is then fitted to a Pressure – Temperature curve and Extrapolated down to the conditions of the moon.

• The calculated value for the sublimation temperature on the moon is

• The calculated amount of energy required to sublimate is 169.1

• The values from the experiment would be compared to these

• This proposed experiment would show the reliability and accuracy of using the Clapeyron-Clausius Equation to predict how sublimation is affected by lunar conditions.

• This data can help give insight into the energy required to

• Further research might go into different methods of sublimation and extraction of ice on the moon.