Study on the Abnormal Heat of Pd-D\textsubscript{2} System

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Source of our idea

Aims and methods of our experiment

- Observe the abnormal heat
- Correlation with deuterium flux
- Find factors affecting the heat such as pressure, temperature
- Measure temperature instead of the heat flow
Schematic view of our apparatus
Schematic view of our apparatus
Picture of our apparatus
Picture of our apparatus
Picture of our apparatus
Black box model of our apparatus

Room Temp. Heating Power Deuterium Pres. T,M. Pump

input

Experiment Apparatus

output

Syst. Temp. Pd Tube Temp. Vacuum
Results of our experiment (5/26)

Temperature Distribution along Pd Tube
Under Room Condition without Filling Deuterium

Temperature (°C)

Time (s)

Room

Middle

Pt 5

Pt 4

Pt 2

Pt 1

Pt 3
Results of our experiment (6/14)

Temperature as a Function of Time

- HeaterM
- Pt2
- Pt3
- Pt4
- Pt5
- HeaterD

Temperature (°C) vs Time (s)
Results of our experiment (6/14)

Temperature Distribution along Pd Tube when Filling Deuterium and Cooling down
Results of our experiment (6/15)

Temperature Distribution along Pd Tube when Filling Deuterium and Cooling down
Discussion of the experiment

Summary of the Conditions when the Abnormal Variation Happened

<table>
<thead>
<tr>
<th>Position</th>
<th>Pt2 Thermistor (105~130mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Range</td>
<td>128°C~138°C</td>
</tr>
<tr>
<td>Max Value of the Variation</td>
<td>~10°C</td>
</tr>
<tr>
<td>Lasting Time</td>
<td>~3000s</td>
</tr>
<tr>
<td>Pressure inside the Pd Tube</td>
<td>~0.14MPa</td>
</tr>
<tr>
<td>Pressure outside the Pd Tube</td>
<td>~2Pa</td>
</tr>
<tr>
<td>Heating Power</td>
<td>~25W</td>
</tr>
</tbody>
</table>
Discussion of the experiment

- Did the Pt2 thermistor work correctly?
  Did the temperature of the Pd tube near Pt2 change?
  Why did only Pt2 change?

Possible affecting factors:
  Keithley Model 2000 DMM
  Resistance of the whole circuit
  of course, temperature change
Discussion of the experiment

- Is the change of temperature caused by filling deuterium?

![Temperature Distribution along Pd Tube when cooling down without Filling Deuterium](chart.png)

Experiment conducted on 6/16
No variation observed
Discussion of the experiment

• How does the deuterium lead to the raising of the temperature?

Possible mechanisms:

Heat Exchange
Detaching and Attaching of Deuterium
Joule-Thomson Effect
Of course, Maybe Nuclear Reactions!
Conclusion of our experiment

• Abnormal Variation of Resistance
• Correlation with Abnormal Deuterium Flux not Detected
• Reproducible (once)

• Further study is expected to identify the reasons!
Suggestions to further study

- Try to prolong the time of the abnormal variation by increasing the heating power

- Filling hydrogen to the Pd Tube to eliminate some possible reasons

- Measure the DC volt to identify whether the abnormal variation is caused by the change of resistance
Thanks

Thanks
Supplement-Power(6/14)

Heating Power as a Function of Time

![Graph showing heating power as a function of time](image)

- Y-axis: Power (W)
- X-axis: Time (s)

The graph illustrates the change in power over time, with notable drops at specific intervals.
Pressure as a Function of Time

Stop Pumping