

Update on results at Coolescence, LLC

Rick Cantwell
Coolescence, LLC
Boulder, CO
rick@coolescence.com
+1 720-565-9690



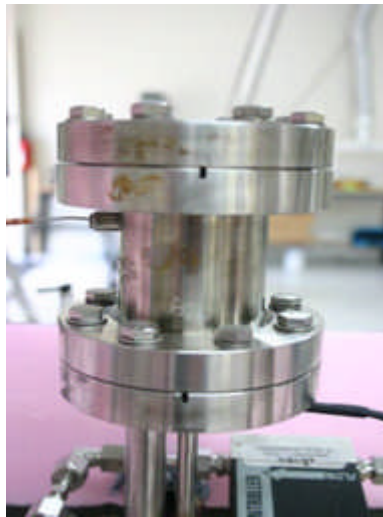
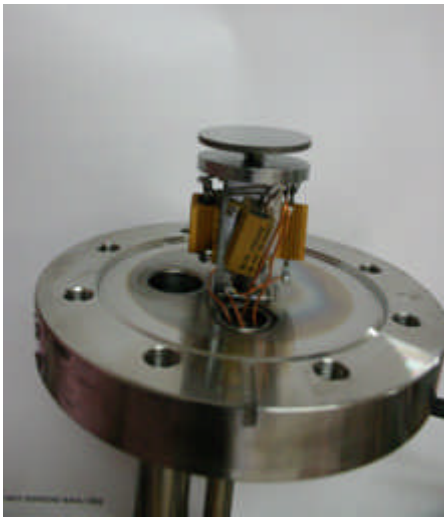
Coolscence, LLC

- Founded in 2005, Angel funded, 3 researchers
- Areas of experiments
 - Calorimetry
 - Glow Discharge initiated LENR
Built on work of Karabut & Energetics
 - Gas flow initiated LENR
Modeled on work of Li



Calorimeter for GD Experiment

- Flow Calorimeter surrounding vacuum chamber (320 cm³)
- Cathode Pt RTD allows Isoperibolic operation
- Built-in Joule Heater

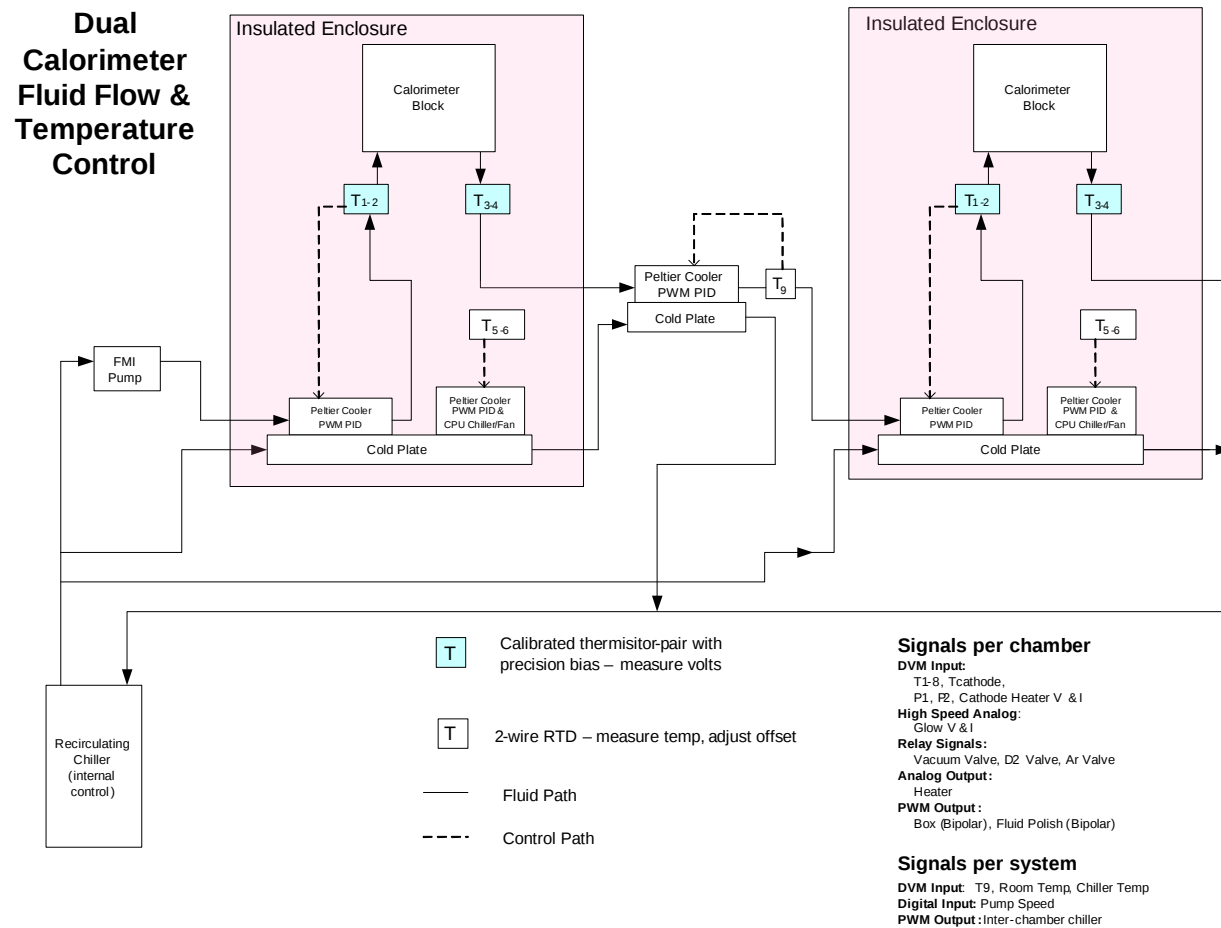


Calorimeter Engineering

- Dual In/Out temp measurement (thermistor)
- 2 stage fluid temp regulation (± 5 mDegC)
- Air temp regulation (± 50 mDegC)



Dual Calorimeter Block Diagram

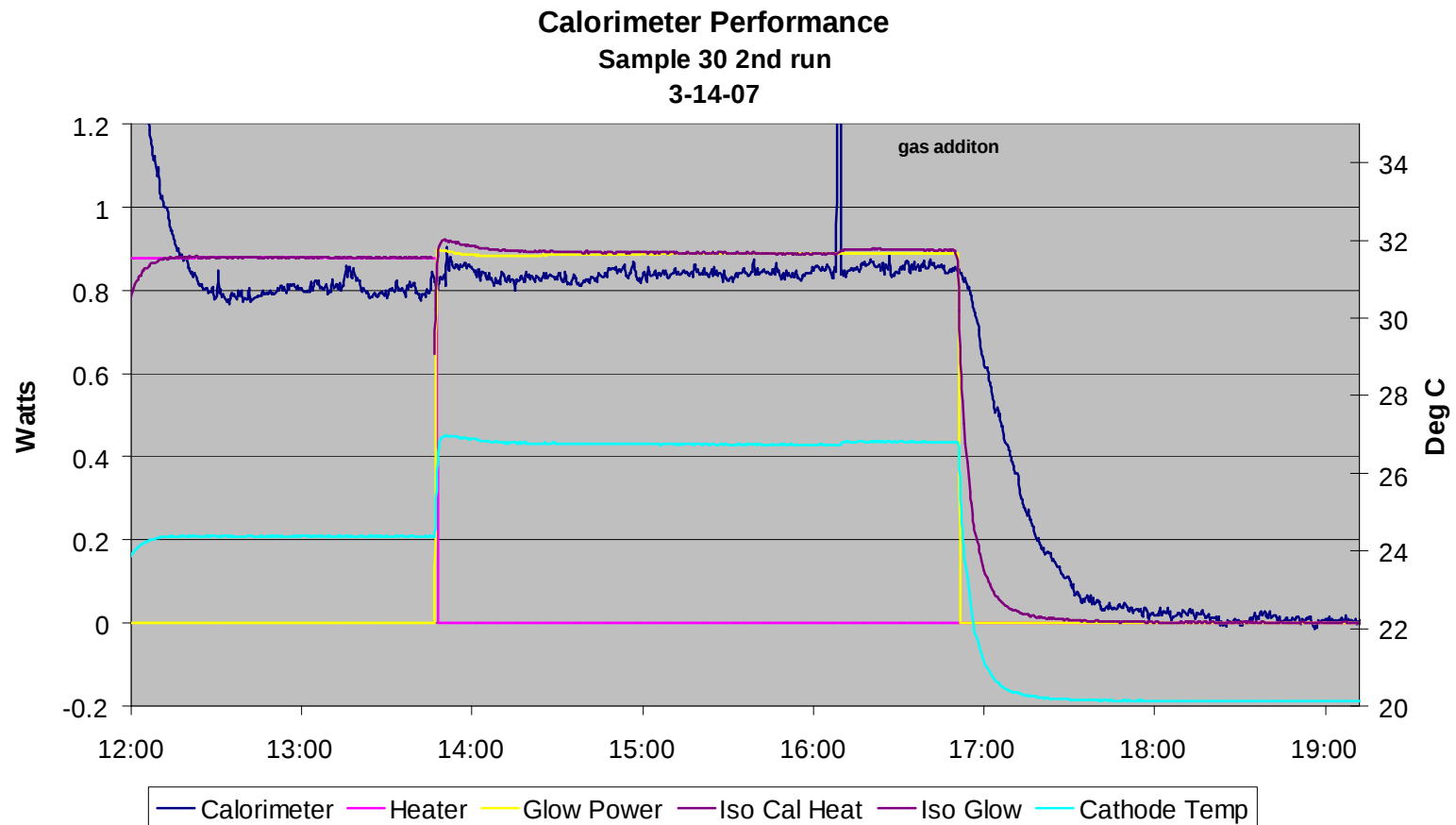


Calorimeter Performance

- Flow Calorimeter
 - Sensitivity: 20mW
 - Capture Ratio: 90-94%
 - Time constant: 19 minutes
- Isoperibolic Calorimeter
 - Sensitivity: 5mW
 - Time constant: 5 minutes
 - Sensitive to pressure, heat location



Typical Performance



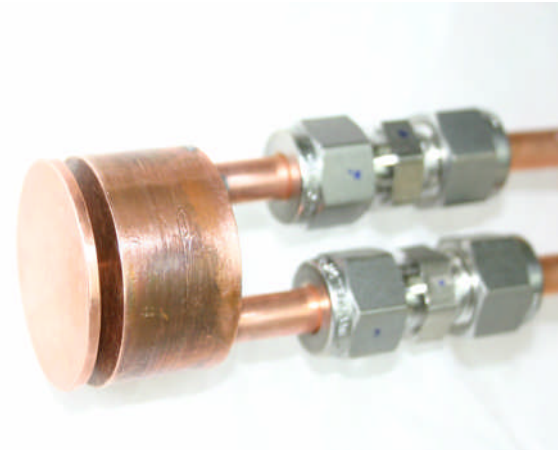
Glow Discharge Loading of Pd

- Initial focus on Glow Discharge initiated LENR using calorimetry to find anomalous heat
- No excess heat results
- Characterize deuterium loading with Glow Discharge



Apparatus & Techniques

- .3 & 1.5 liter chambers
- Glow in 1-10 torr D₂
- Pd foils (25-100 micron) attached with diffusion weld
- Pd & Pd alloy thin films (1-5 micron) on copper
- Loading measured by gas loss (pressure drop)
- Verify by pressure rise during unloading
- Capacitive Manometers

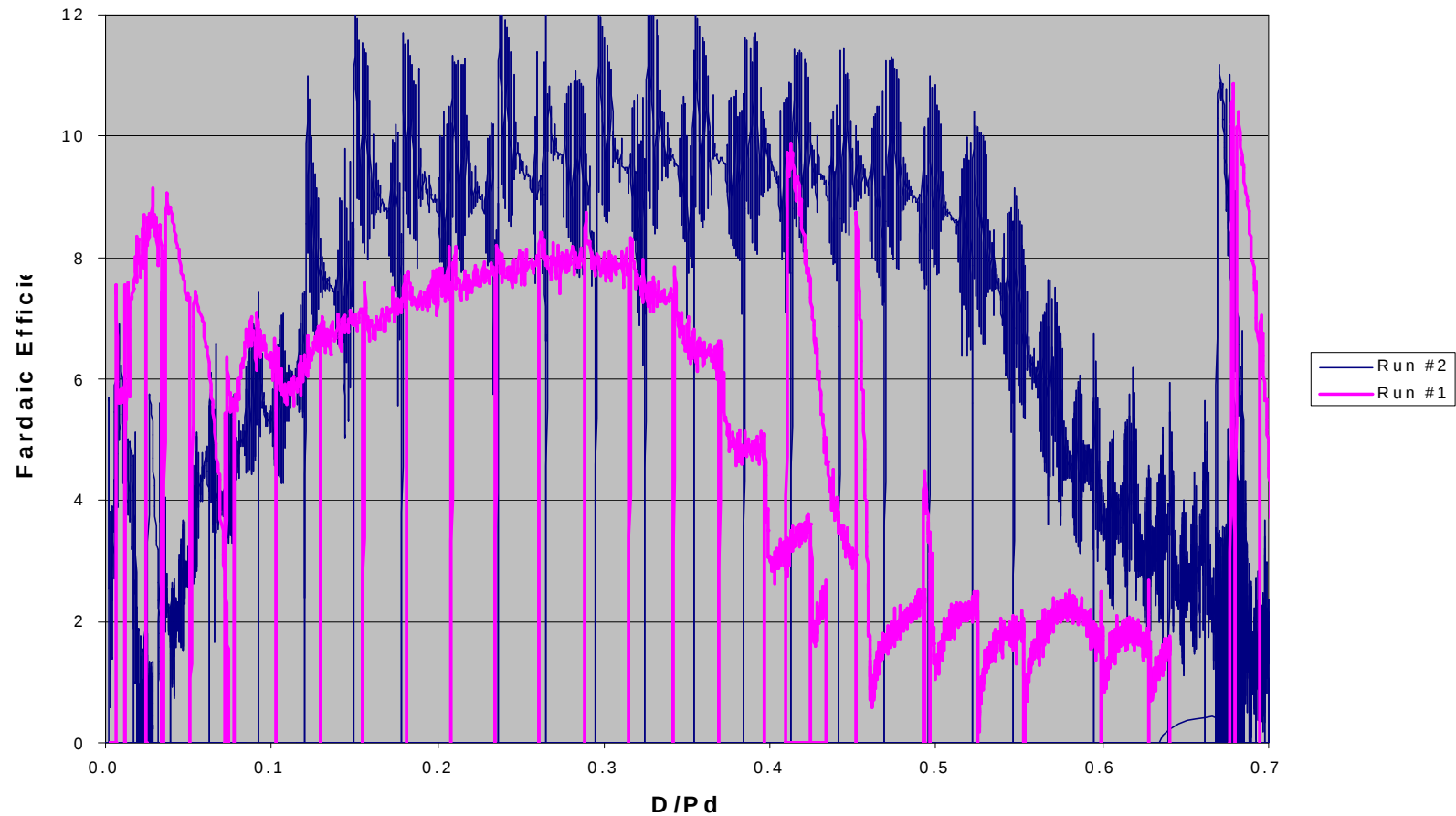


Major Loading Observations

- No high loading ($D/Pd < .7$)
- No bulk loading at higher temperatures
- Loading rate proportional to current ($J < 100 \text{ mA/cm}^2$)
- 5-10 D's loaded for each D+ of ion current (Faradaic Efficiency 5-10)
- High D flux during pulsed discharge ($.01 \text{ sccm/cm}^2$ per mA of glow)
- Loading rate insensitive to temperature, voltage, and pressure
- GD causes damage to Pd (sputtering)

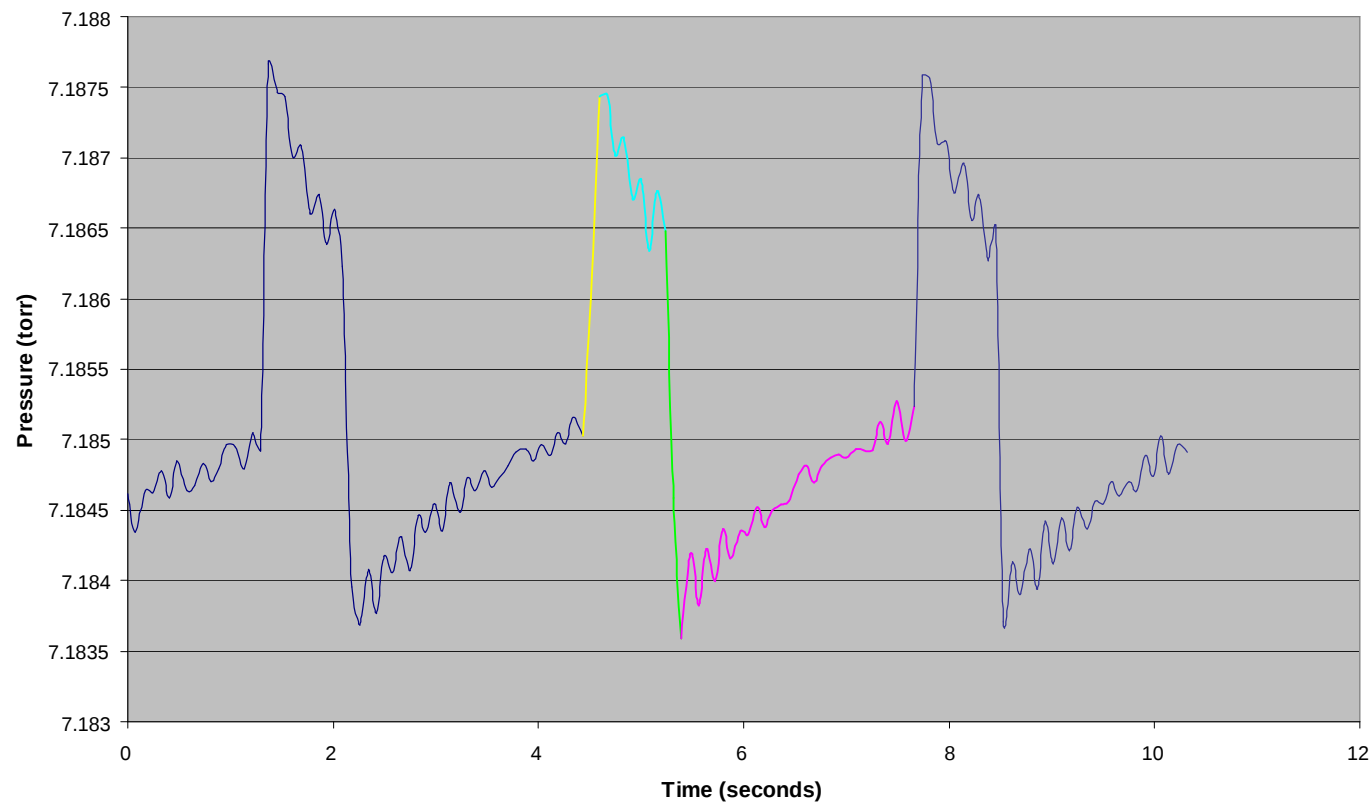


Loading Efficiency vs. D/Pd

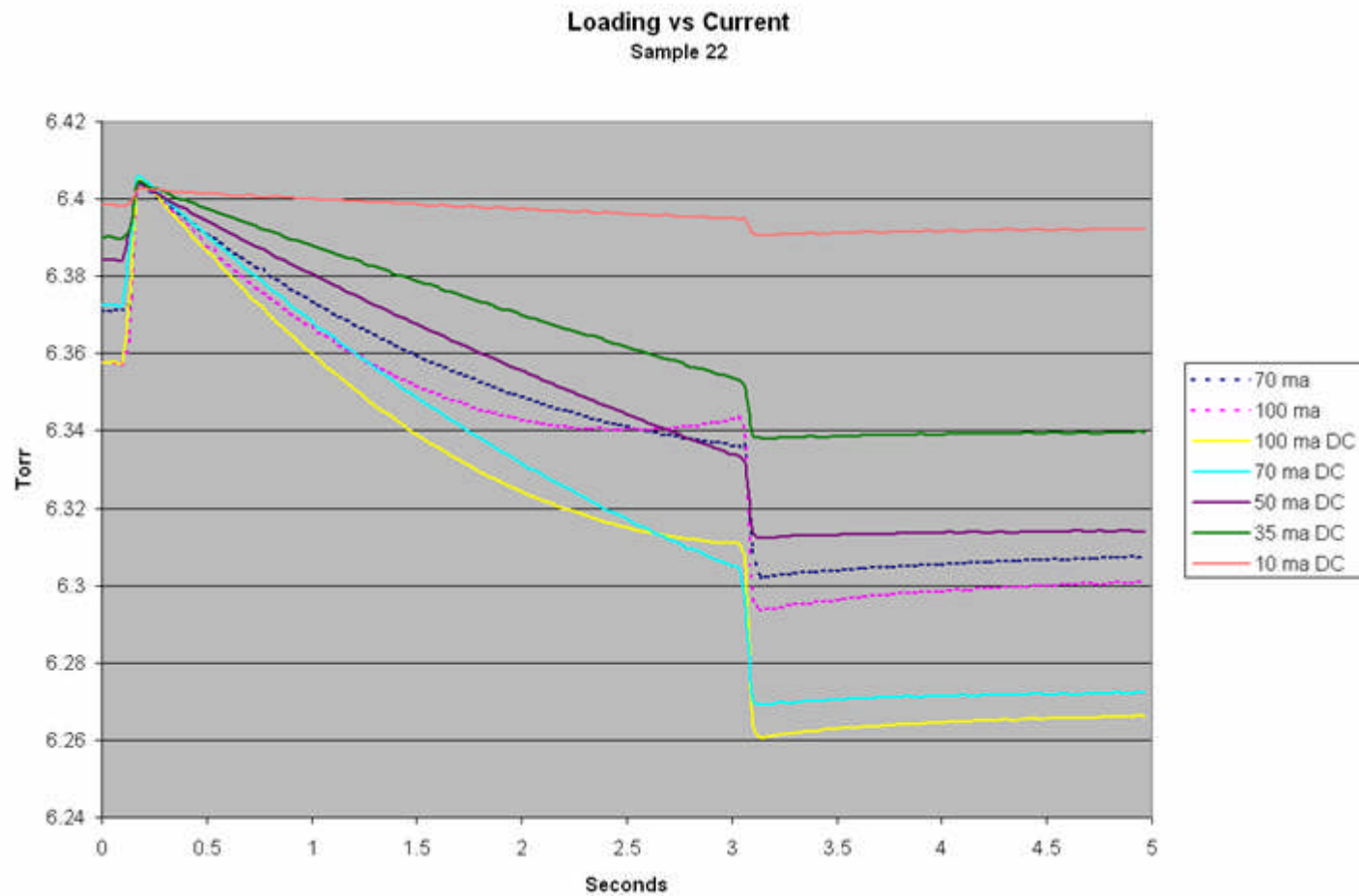


Pulsed Glow Discharge

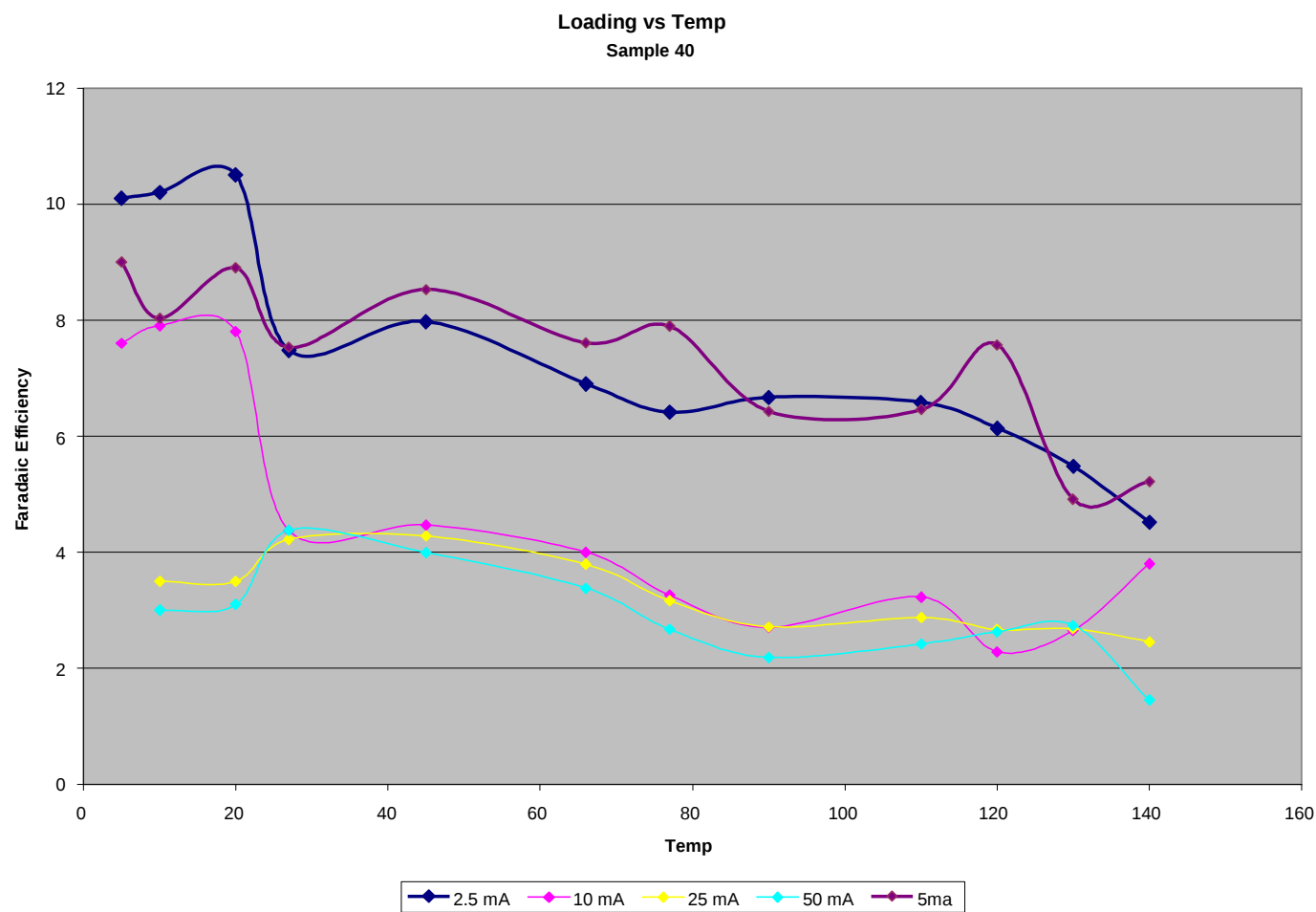
Typical pressure pulse for loaded Pd



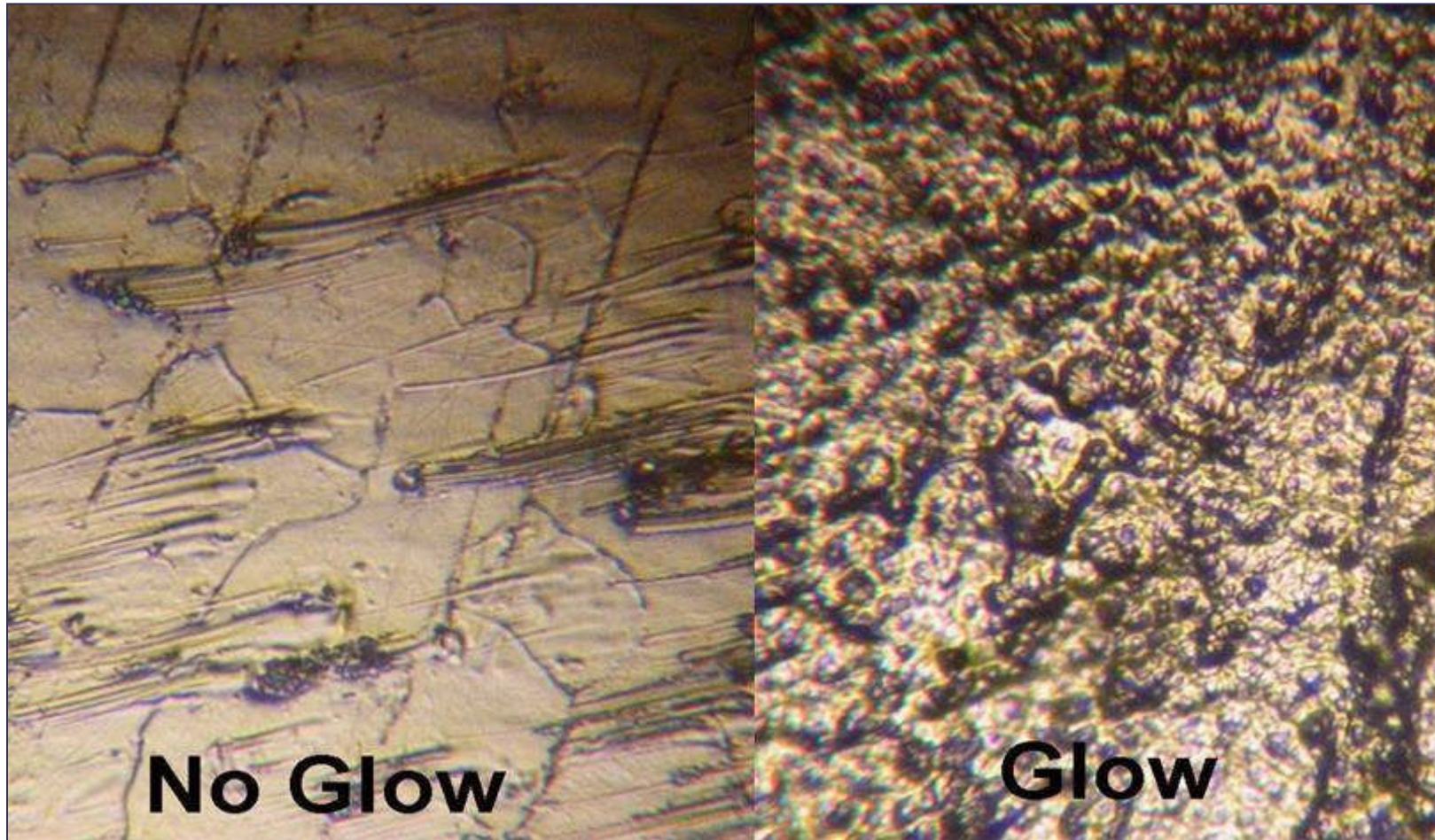
Loading vs. Glow Current



Loading Rate & Temperature



Physical Effects of GD



Questions raised by GD loading results

- What is mechanism of loading?
- What limits loading to $D/Pd \sim .7$?
- Are common mechanisms at work in GD (Karabut, Savvitamova, Energetics, ...), gas flow (Li) and gas flow transmutation (Iwamura)?
- Was high loading present in earlier GD and gas flow experiments?



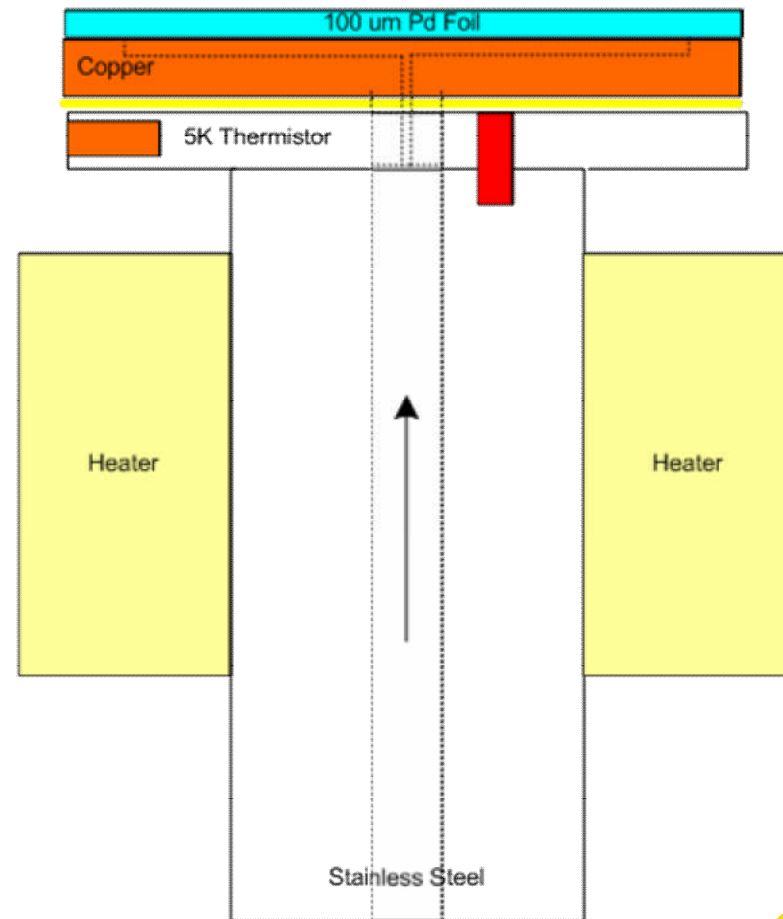
Gas Flow Experiment

- Flow D2 through Pd foil
- High pressure side ~ 1000 torr D2, volume 15 cc
- Low pressure side $< 1e-3$ torr, volume 320 cc
- Ramp foil temperature with resistive heater 120-170-120 deg C
- Chamber enclosed in constant temp environment (calorimeter)
- Look for anomalies by subtracting heating ramp from cooling ramp

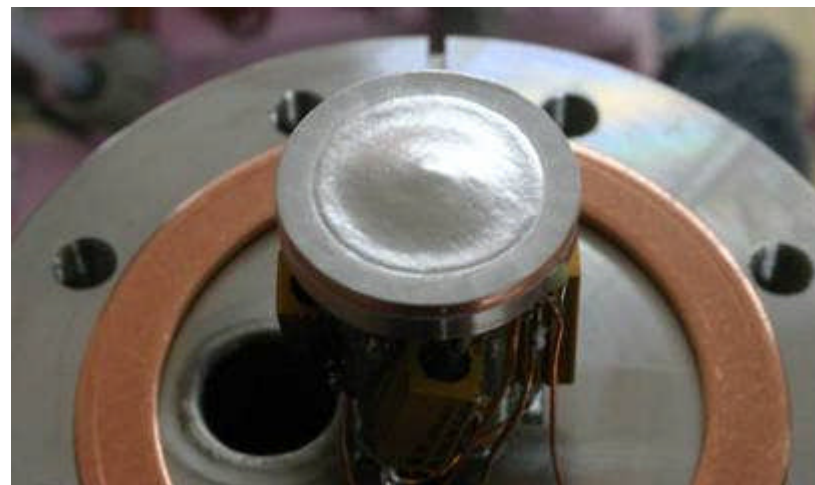
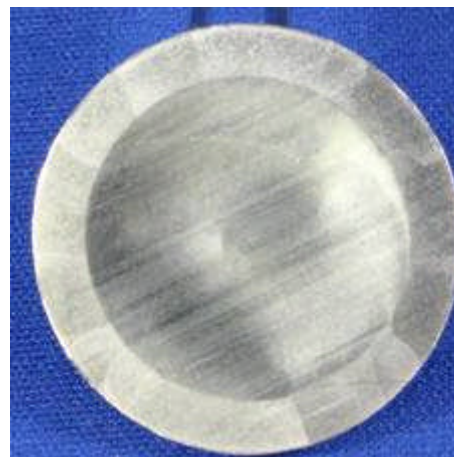
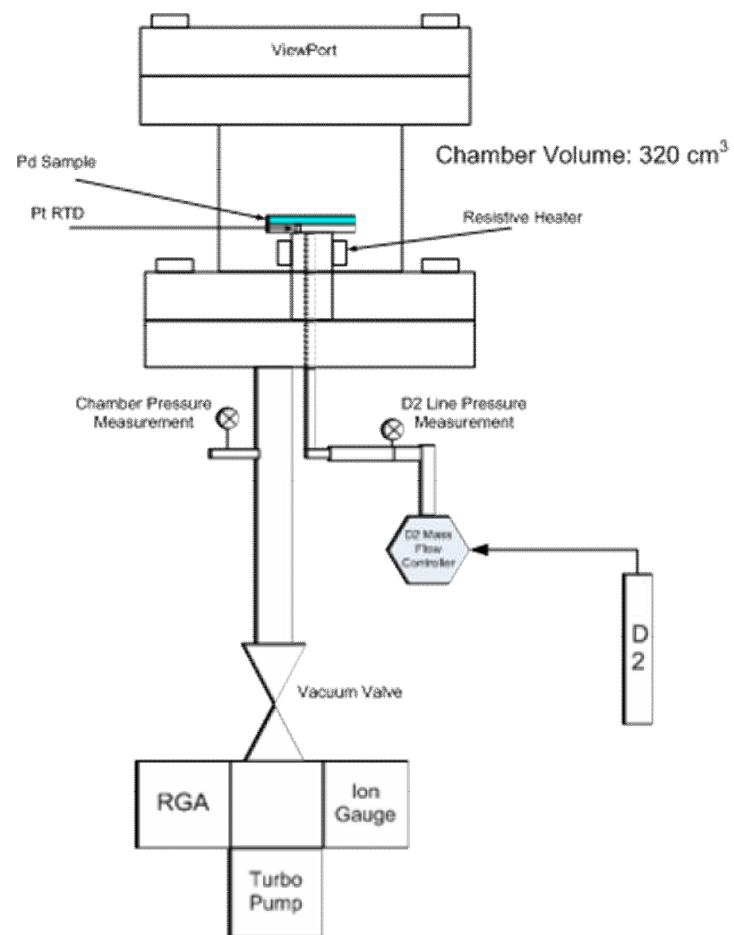


Sample Preparation

- 100 micron Pd foil diffusion welded to copper holder
- Pd/Cu assembly screwed into stainless steel holder
- Sealed with 75 μm Teflon gasket

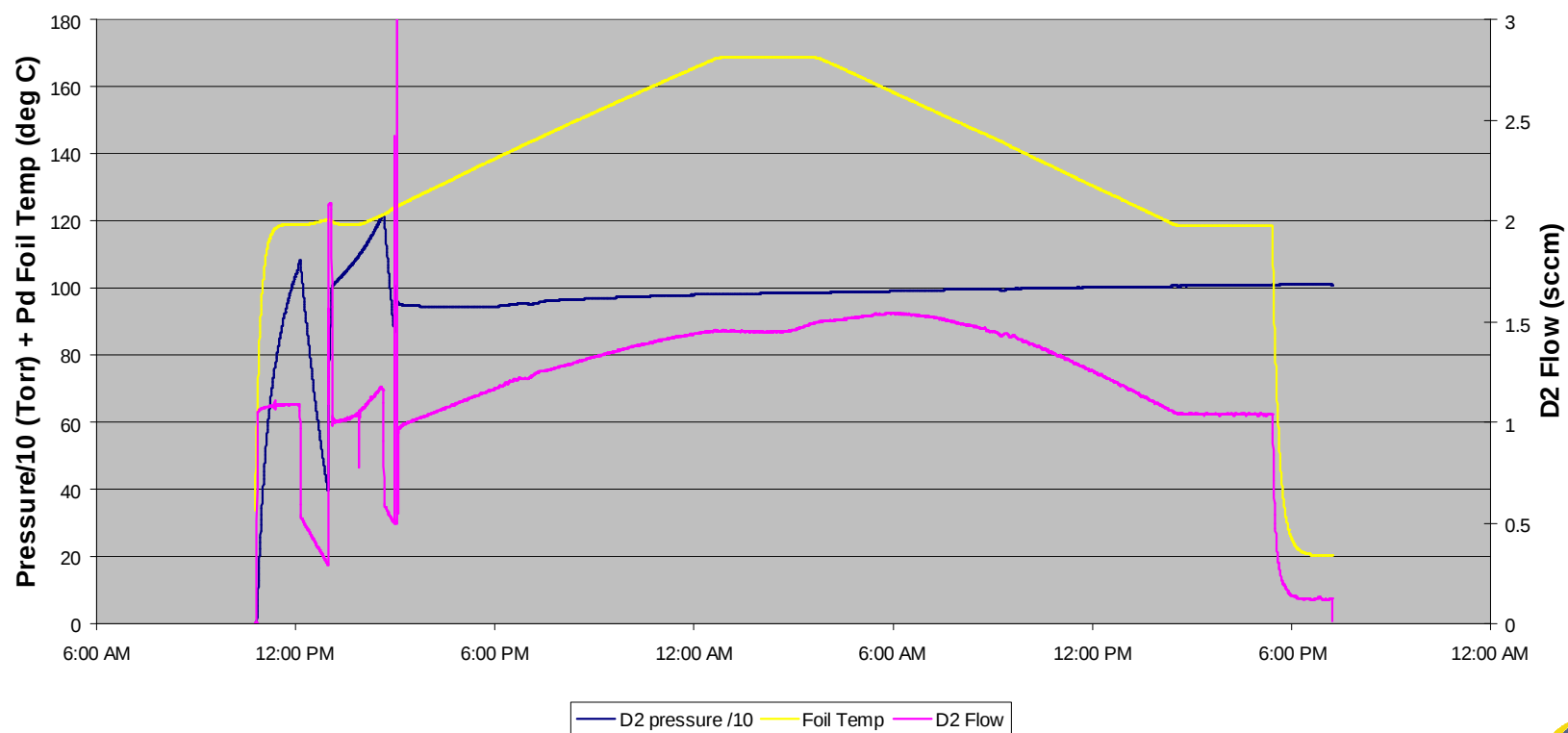


Gas Flow Apparatus



Typical Gas Flow Run

Pd Foil Temperature & D2 Flow
Sample 52 run #4 8-3-2007



Acknowledgements

- Scott Little
- Ed Storms
- Xing Zhong Li

