Bob Higgins has taken a look at what he thinks might enable the experiment:

10 liter LN2 dewar - eBay $320
LN2 - local ~$10
D2O 100ml from United Nuclear - $90
LiSO4 monohydrate - eBay $17
Ti wire 16ga 25ft for cathode (may choose smaller gauge) - eBay $13
Pt wire for anode - I have some I can use for this (it will be reusable)
Glassware for experiment - I have this
Power supply for electrolysis - I have this

Video camera for filming - I have 2 - one 1080p and one 720p.

If a neutron shield becomes necessary, we will need a water container and boric acid (cheap)

Looks like about $450 of new supplies.

Rough suggested protocol
Would envision making a 1cm OD tightly wound inner cathode coil of Ti - would extend outside the bath for penetrating contact outside the bath. This would be surrounded by a 2cm ID coil of Pt. Driven from a power supply in constant current mode. Then, pull the cathode out, and drop it into a foam container of LN2 placed as close as possible to the neutron detector. Possible have a remote string to drop in the Ti coil. May want to monitor the loading for neutrons. Presumption is that once loaded, it will stay loaded for at least minutes when out of the charging bath.

<u>20160926 - Higgins:</u> I had some additional thoughts about how this experiment could be expanded. Suppose the titanium is a stiff wire coil maybe 1cm diameter and 1.5cm tall with reasonably long leads maybe 4cm. Have one end of the coil bent so as to have its lead come back through the center of the coil - now both terminals of the coil are on the same physical end.

> **Experiment 1** - Put the coil as the cathode in a solution of D2O and LiSO4. Electrolyze to load the titanium coil. Remove the coil and attach a switchable current source to the 2 terminals of the coil. With no current flowing, dip the coil into LN2 and then let it stabilize in temperature. Then pull the coil out of the LN2 and heat the coil using a high current to temperature shock it going positive. Then while hot, dip it back into the LN2 for a negative temperature shock. Monitor for both gamma spectrum and neutrons. Concerns: The Ti coil may not load due to TiO2 on its surface; neutron output may be small.
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> **Experiment 2** - Now, consider that this thermal shocking may have other effects. For example, Ti forms a VERY stable oxide that will inhibit loading or slow loading of the deuterium. Suppose the Ti coil was first prepared by thermal shocking many times (LN2 - heated - LN2), and then was loaded with the deuterium in the same

electrochemical way as Experiment 1. Then thermal shock as in Experiment 1 while monitoring for gamma spectrum and neutrons. Concerns: Thermal shock may not be sufficient to break the TiO_2 stable oxide; neutron output may be small.

Experiment 3 - Address the issue of small number of neutrons. The proposal is to build an automated shocking system that would consist of a computer driven motorized dunking apparatus with a computer synchronized heating of the coil. If the pulse counting from the gamma spectrometer ROI output and the neutron counter are captured in synchronism with the shock cycle, then the cycles can be overlaid and summed to produce a gamma and neutron waveform vs. time in the shock cycle. Under computer control, many synchronized cycles can vastly improve the signal to noise ratio (10-100x). The gamma spectrometer could simply continue integrating over the multiple cycles to get a better signal to noise spectrum.

Experiment 4 - Provide the loading with a D_2 gas at 100 bar, perhaps slightly warmed (150°C). This could be done with a small chamber that was filled from a lecture bottle of D_2. Then repeat Experiment 3.