

# STATUS OF GENESIS Mo-Pt FOILS

## -Fighting with mud-

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# Mo-Pt Foils Team Member

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Alex Bixler

A photograph of a large, circular, metallic collector lid for the SRC. The lid is covered in a crinkled, silver-colored material, likely a thin metal coating. It is surrounded by a thick, gold-colored insulation layer. The lid is mounted on a complex metal structure, possibly a vacuum chamber or a support frame. The background shows a laboratory setting with various equipment and structural elements.

# SRC Lid Collector

$\sim 8,000 \text{ cm}^2$  of Mo coating ( $\sim 300 \text{ nm}$ ) on Pt ( $\sim 48 \text{ }\mu\text{m}$ )

All foils have Utah soil contamination on the surface,  
but the amount is highly variable.

Minimum requirement for  
decontamination of Utah dirt  
<1 mg over 8,000 cm<sup>2</sup> surface  
or  
<100 ng/cm<sup>2</sup>

40391

# Development of surface cleaning

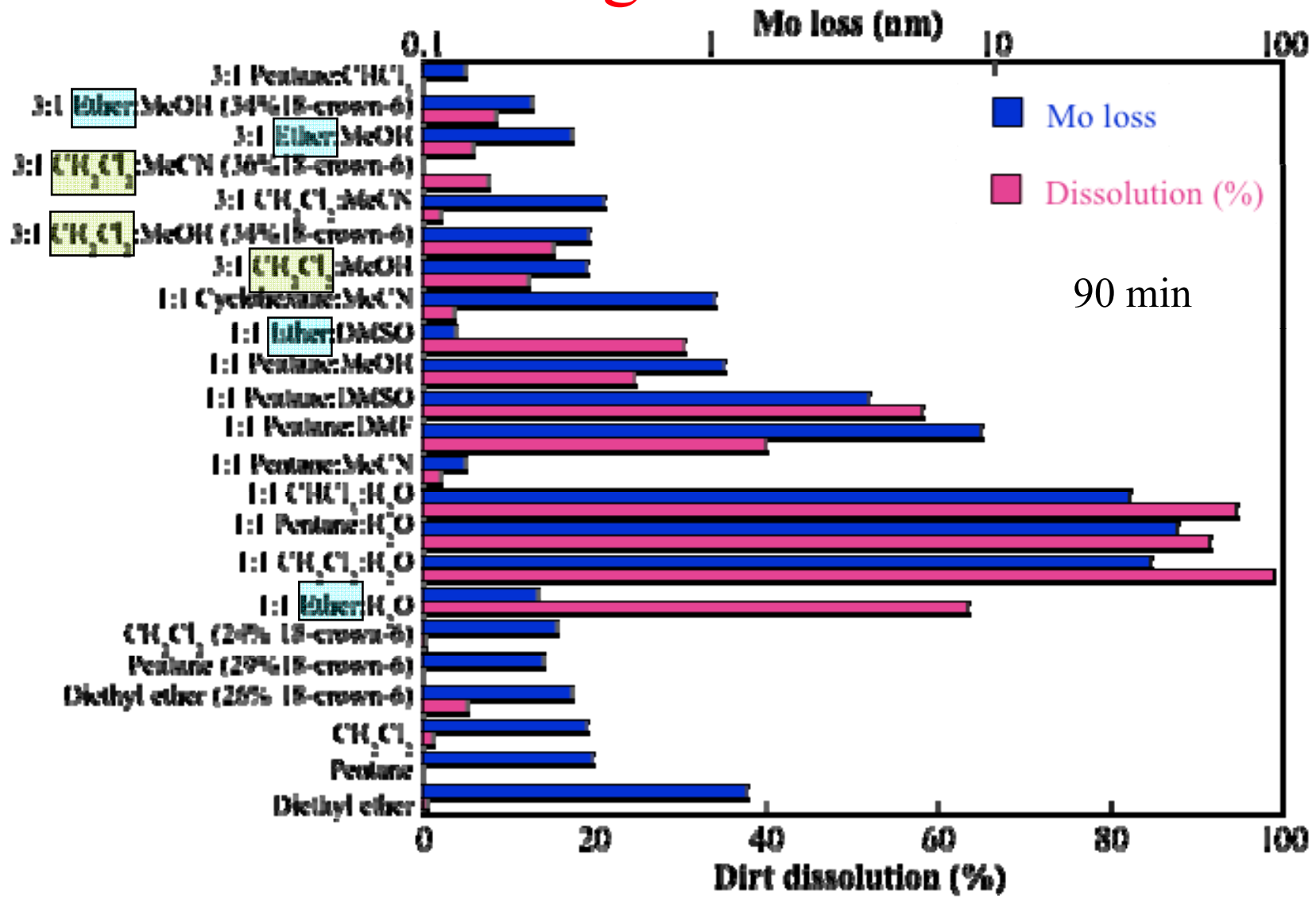
- Cut 1-3 cm<sup>2</sup> Mo-SS or Mo-Pt foil
- Weigh foil by a microbalance (0.1 μg level)
- (Spread Utah dirt over the foil and dry)
- Weigh foil (+dirt)
- Apply chemical/physical treatment
- Weigh foil (measure decontamination of dirt)
- Measure Mo in solvent by atomic absorption spectrometer (1 μg Mo/cm<sup>2</sup> ≈ 1 nm Mo)

# Development of surface cleaning

Test more than 70 reagents  
using more than 600 foils by March 2008

Additional ~500 foils since 2008 science meeting

# Boiling Solvent





# Physical Cleaning Methods

CO<sub>2</sub> Snow

Replica methods

Bubble Agitation

Boiling Solvent

Vacuum Cavitation Streaming (VCS)

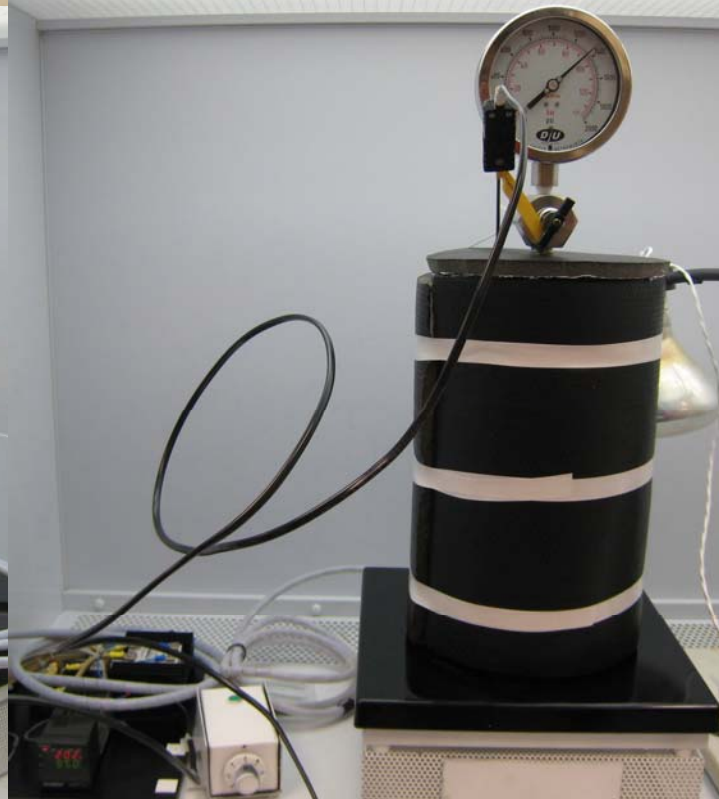
Supercritical Fluid (SCF): SC-CO<sub>2</sub>

Megasonic vs. Ultrasonic

**H<sub>2</sub> Hydrogenation**



# H<sub>2</sub> Hydrogenation



# H<sub>2</sub> Hydrogenation

Oxidized Mo surface was changed to less chemical reactivity

110 atmosphere (11 MPa or 1,600 psi) 1 day - 7 weeks

How long?

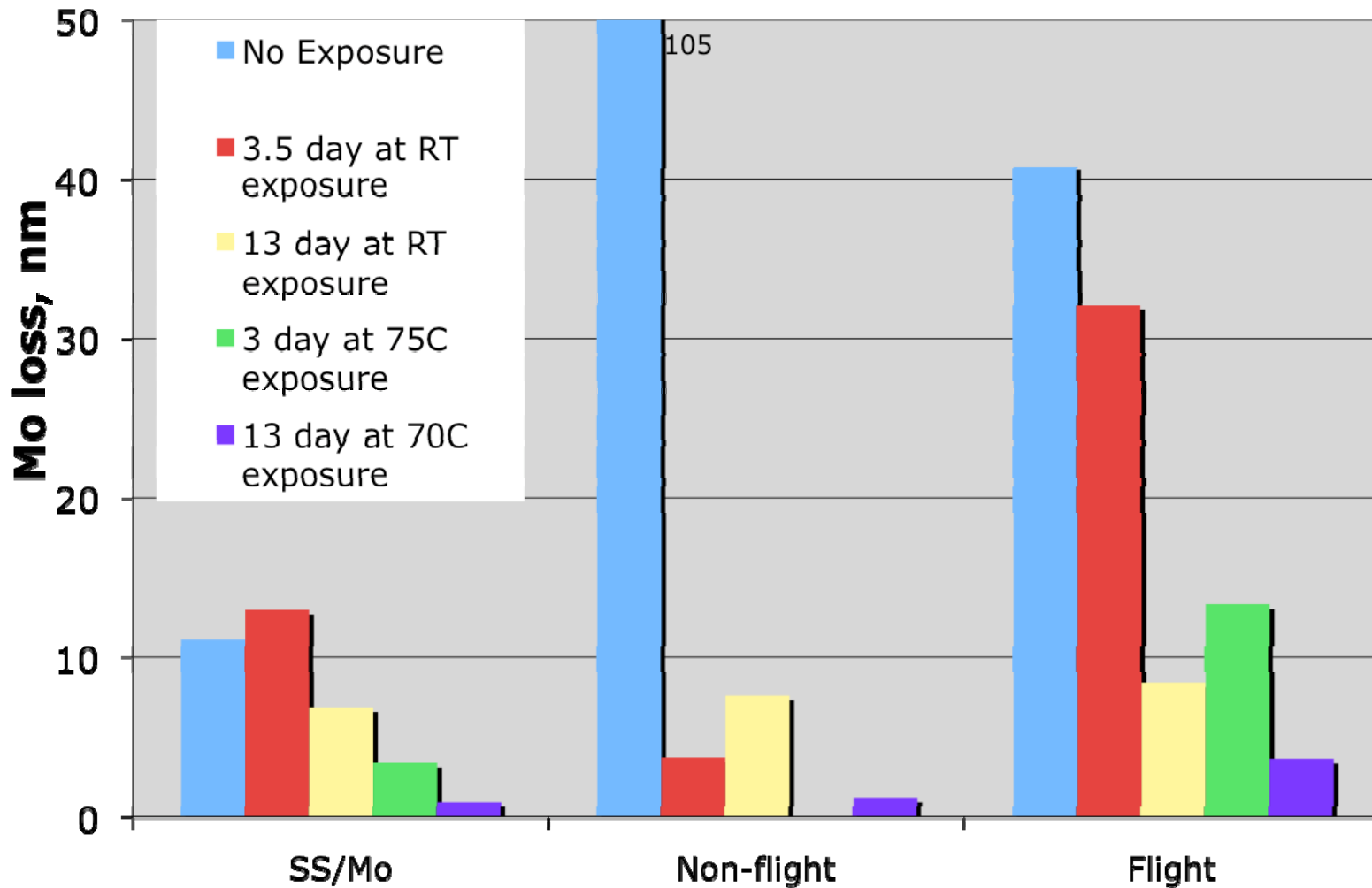
Higher pressure?

Temperature: 20°C - 85°C

How higher temperature?

Affect to dirt?

# Comparison of Mo removal by H<sub>2</sub>O (60min)



# Effect of Temperature

Based on Sloczynski, Journal of Solid State Chemistry (1995)

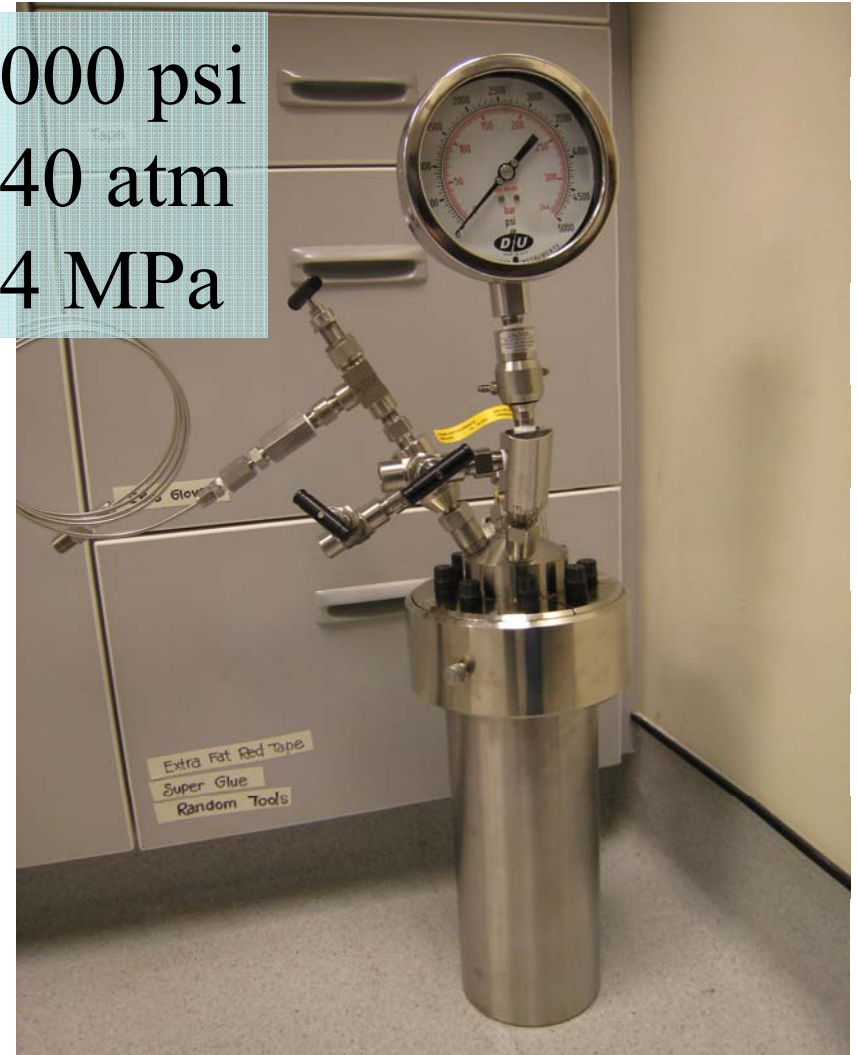
Note: H<sub>2</sub> pressures used in reference were ~1000 times lower than our experiments.

# H<sub>2</sub> Hydrogenation

1600 psi  
110 atm  
11MPa



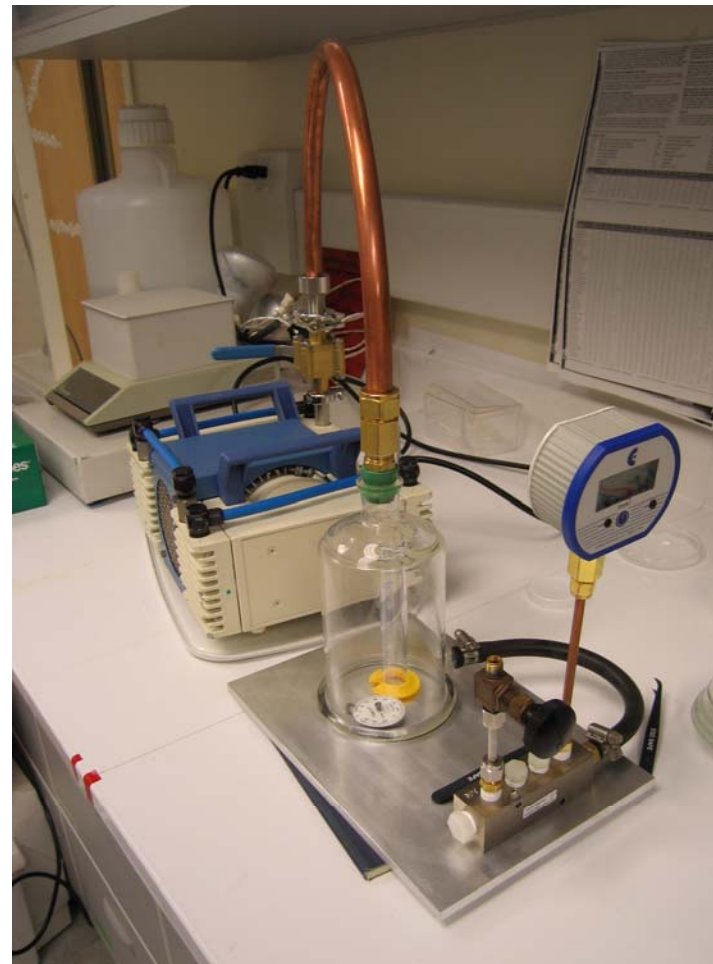
5000 psi  
340 atm  
34 MPa



# Vacuum Cavitation Streaming (VCS)

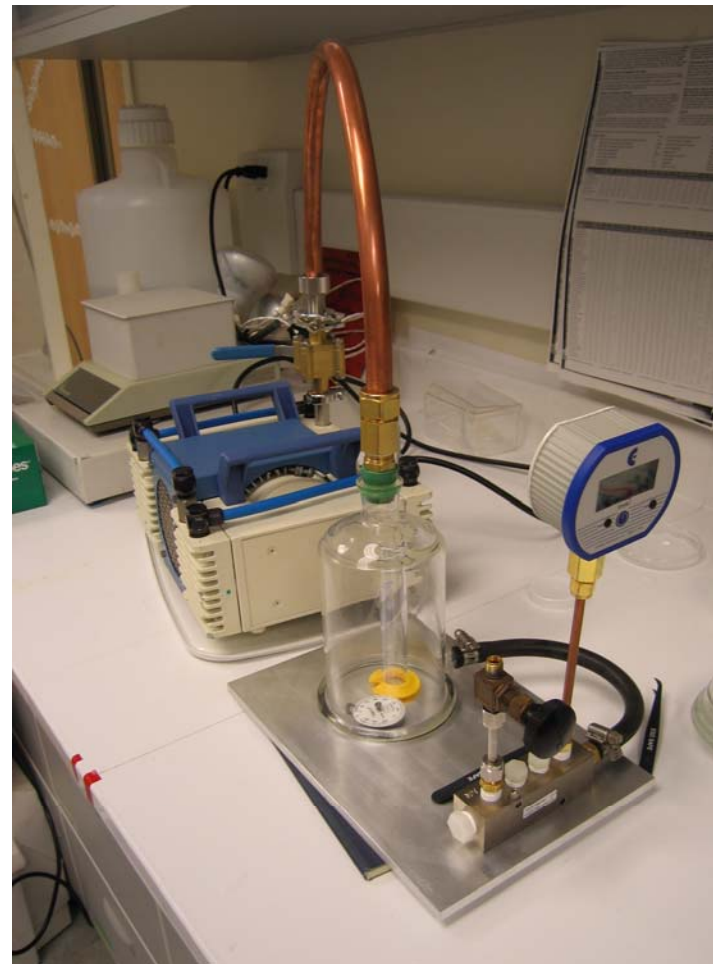
Hyperflo (Phoenix)

Cavitation was very strong and rougher



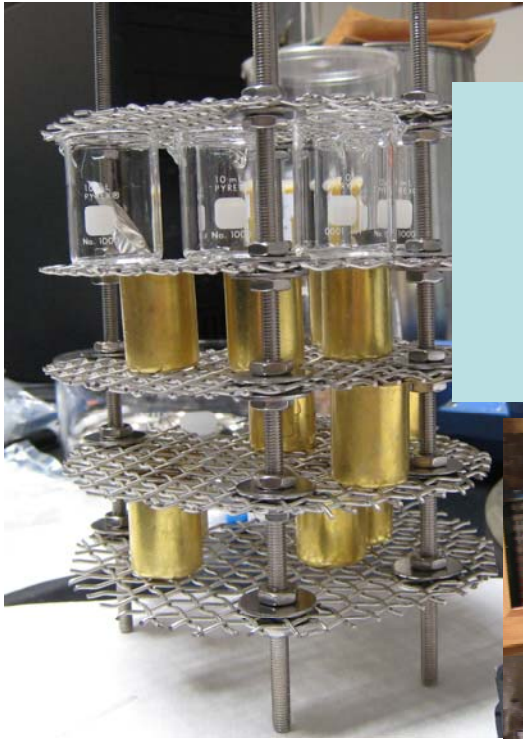
# Vacuum Cavitation Streaming (VCS)

Difficult to control cavitation  
So far our cavitation method  
was not strong enough to  
remove dirt  
Need more work



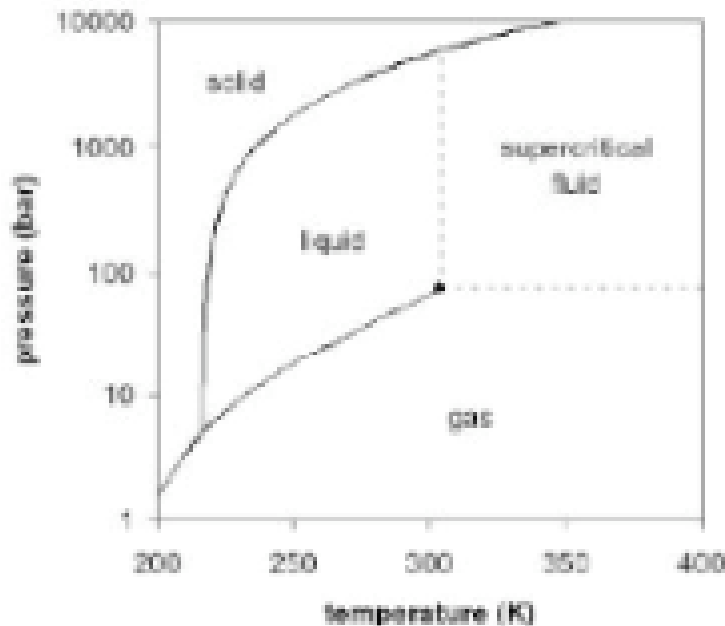


# Supercritical Fluid SC-CO<sub>2</sub>



# Supercritical Fluid

## SC-CO<sub>2</sub>



Liquid CO<sub>2</sub>

SC-CO<sub>2</sub>

No effect for Mo (MoO<sub>3</sub>) surface  
Not strong enough to remove dirt  
Good for organic contamination

SCF + additive

SC-CO<sub>2</sub> + MeOH (20%)

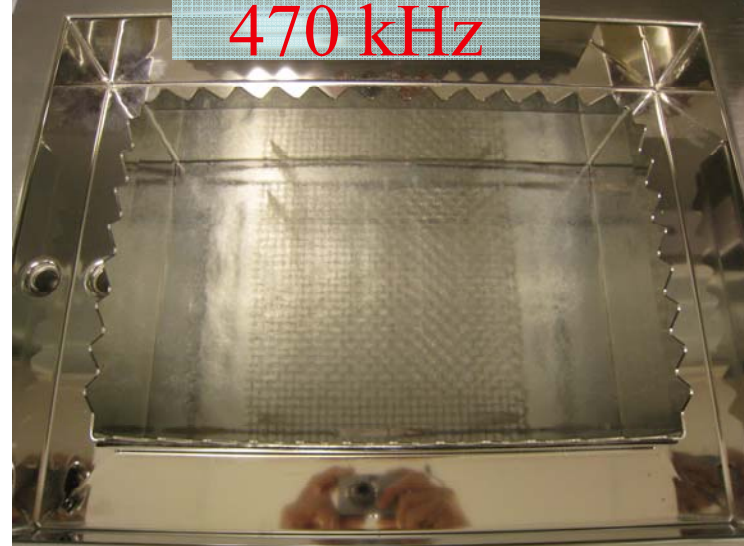
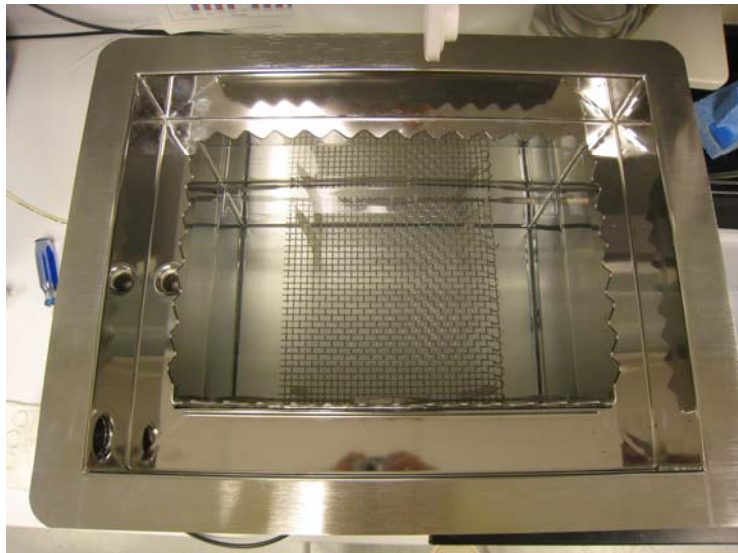
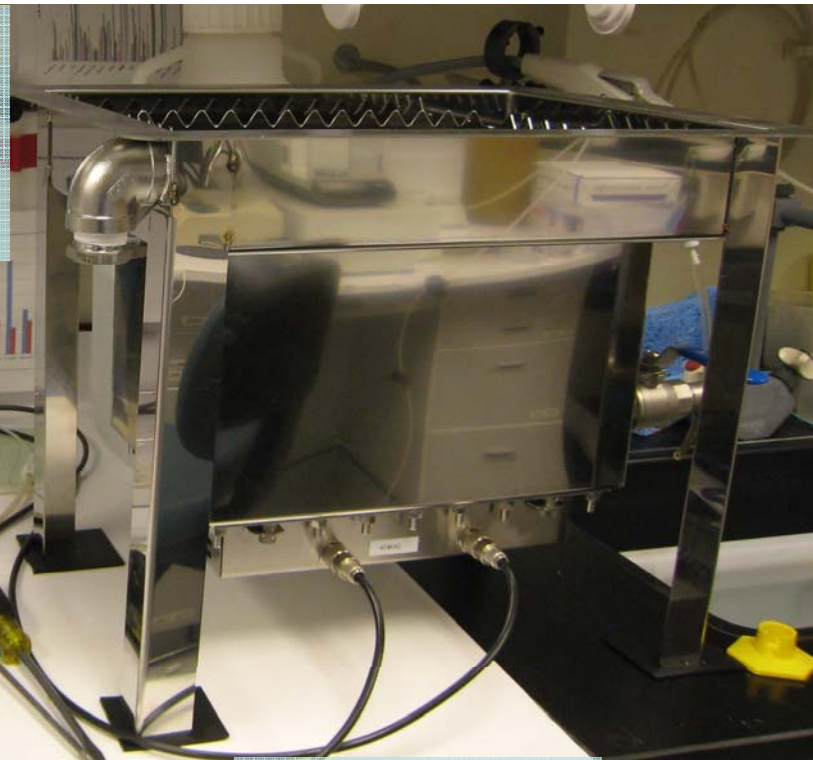
Surfactant?

Need mixing SCF

SCF + Megasonic?

# Megasonic

Megasonic Sweeping Inc.



# Megasonic

Test 2 companies

PCT systems

Megasonic Sweeping Inc.

Some Mo loss were observed but not consistent results.

470 kHz vs. 700-800 kHz?

Higher frequency?

Observed significant dirt removable

# Next

Continue test

H<sub>2</sub>, SCF, Megasonic, and ..

- Difficult to work at company (organic solvent, reproducibility)
  - Require system in our lab
- Need a mapping capable XRF for effective test and verification of cleanness



# Vacuum Cavitation Streaming (VCS)

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	Vp@25°C (mmHg)
H <sub>2</sub> O	3.2
Methyl ethyl ketone (MEK)	90
Cyclohexane	100
Hexane	150
Chloroform	200
Acetone	250
Cyclopentane	320
Pentane	500

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