

The JPL logo is rendered in a bold, red, sans-serif font. The letters are thick and blocky, with the 'J' and 'L' having long horizontal tails that extend to the left and right respectively. The 'P' is also thick and blocky, with a small loop at the top.

NASA
Jet Propulsion
Laboratories:
Planetary Protection Group

Erol Chandler
Mentor: Dr. Moogega Cooper
with Kimberly Lykens



VIKING

MARINER

CLIMATE ORBITER

RECONNAISSANCE ORBITER

GLOBAL SURVEYOR

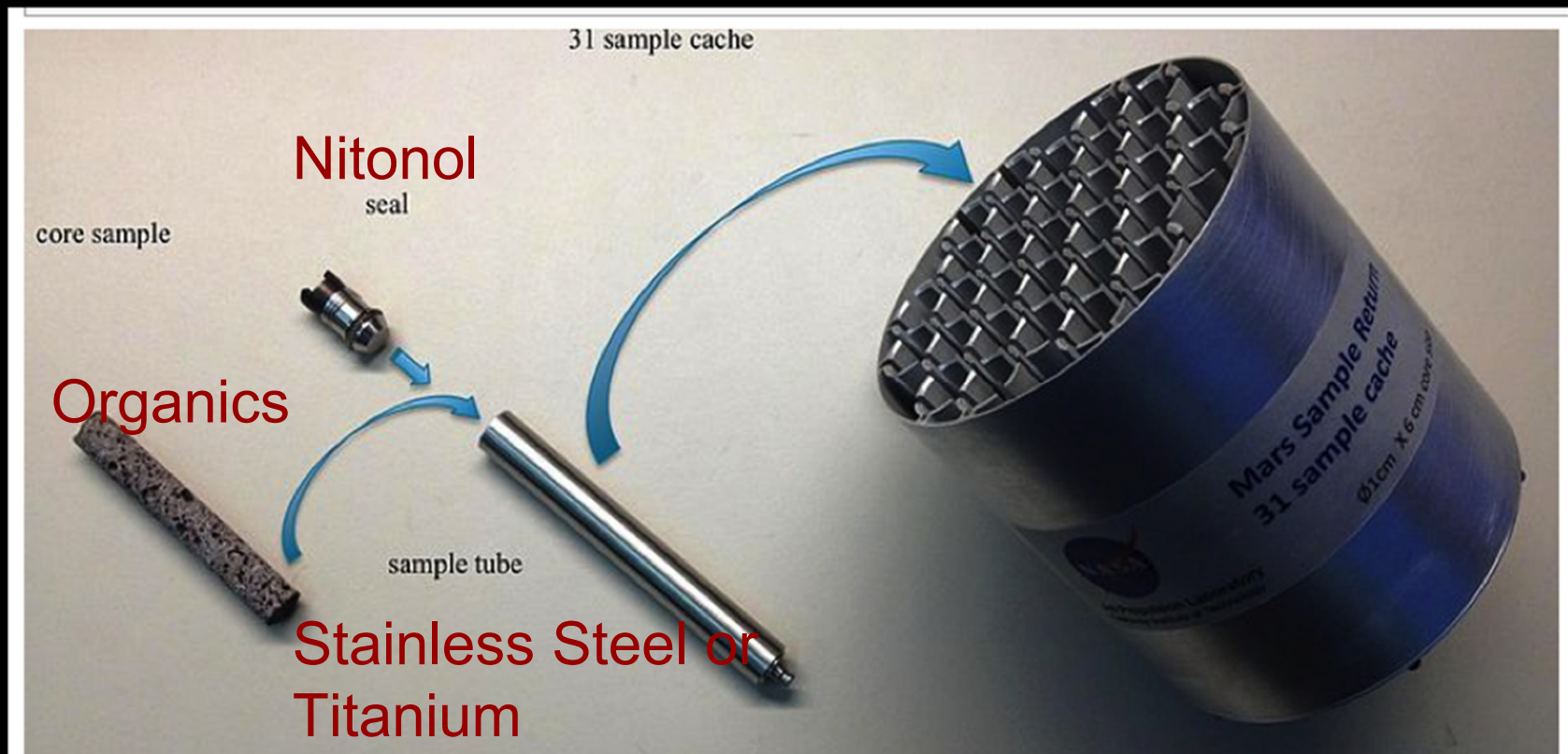
SPIRIT

OPPORTUNITY

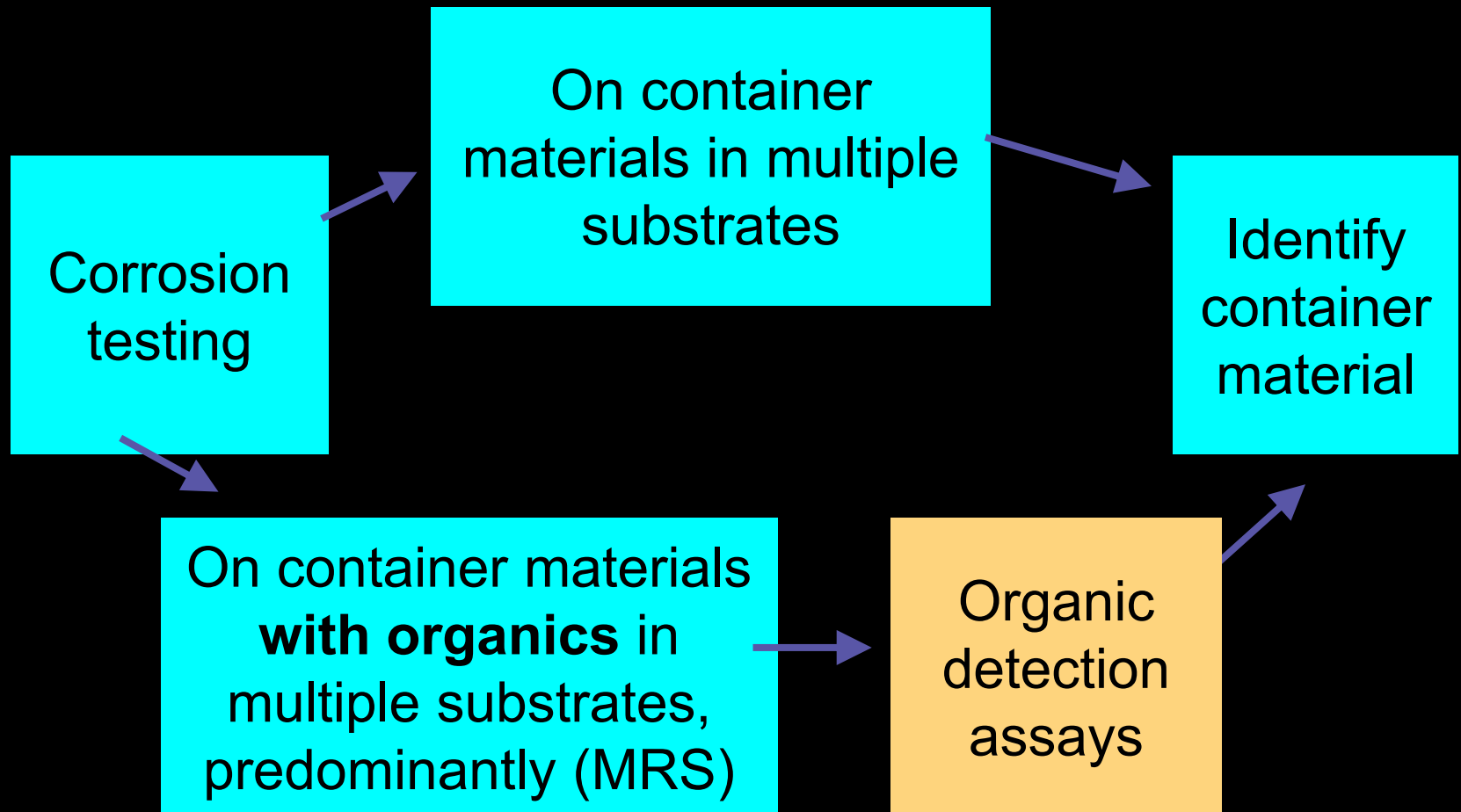
CURIOSITY



Future Mars Sample Return Mission



Future Mars Sample Return Mission



Future Mars Sample Return Mission

Sample Container
Reliability

-Will it corrode on
Mars?

Sample/Container
Interaction

-Will the sample (and
possible organics)
interact with the
container?

Future Mars Sample Return Mission

Run corrosion tests on metals

Titanium

Nitonol (Nickel Titanium)

Stainless Steel 304

In substrates identified on Mars

Halite (BioXtra, $\geq 99.5\%$ (AT))

Salt

Found by Phoenix

Magnesium Sulfate

Salt

Found by Phoenix

Perchlorate

Salt

Found by Phoenix

Potassium Chloride

Salt

Found by Phoenix

Hematite

Iron Oxide

Found by MER

Ferric sulfate + Gypsum + Epsomite

Sulfates - Hydroxide and hydrous

Found by MER

Sulfuric Acid

Acid

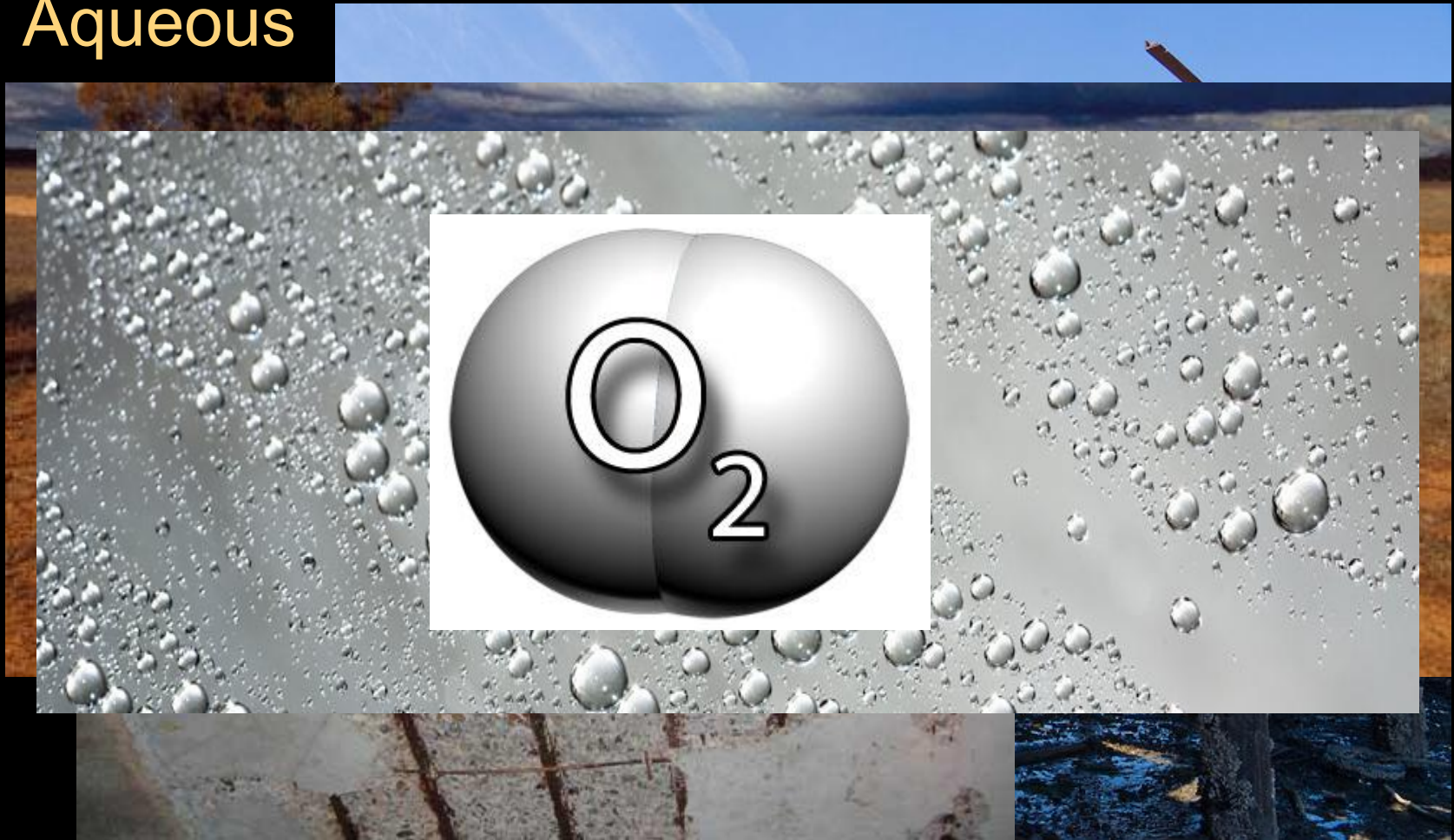
Hydrochloric Acid

Acid

Mars Regolith Simulant (MRS)

History Corrosion Testing

Aqueous



History Corrosion Testing

Non-Aqueous



My Instrument

Parstat 4000 The latest and greatest for all your electrochemical testing needs.

Get it to work...
You are the expert!

My Instrument

Parstat 4000 The latest and greatest for all your electrochemical testing needs.

- *Potentiodynamic Polarization testing?*

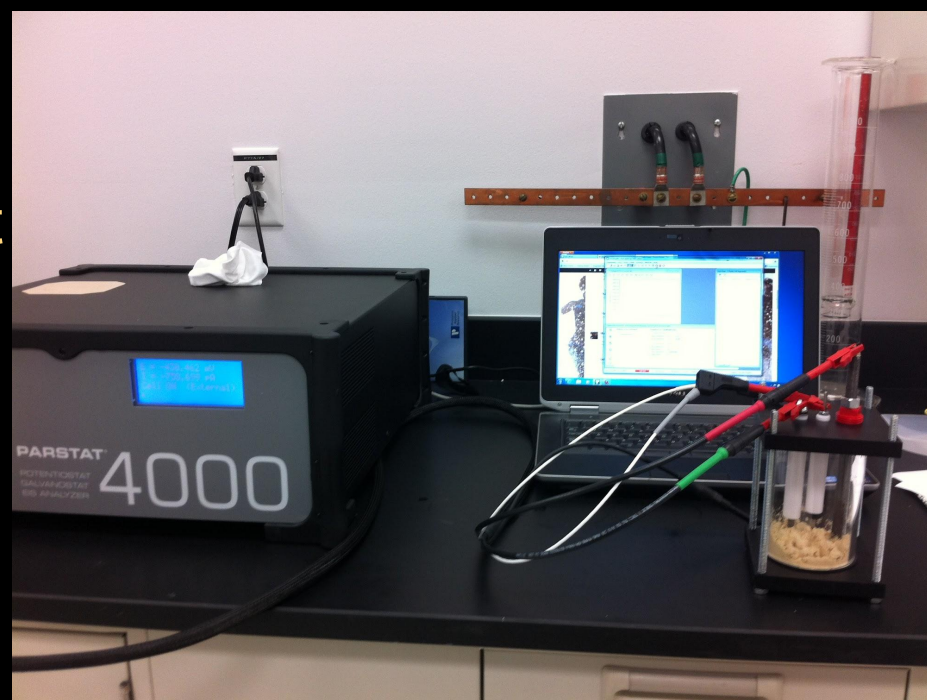
Got it

- *Chronoamperometry?*

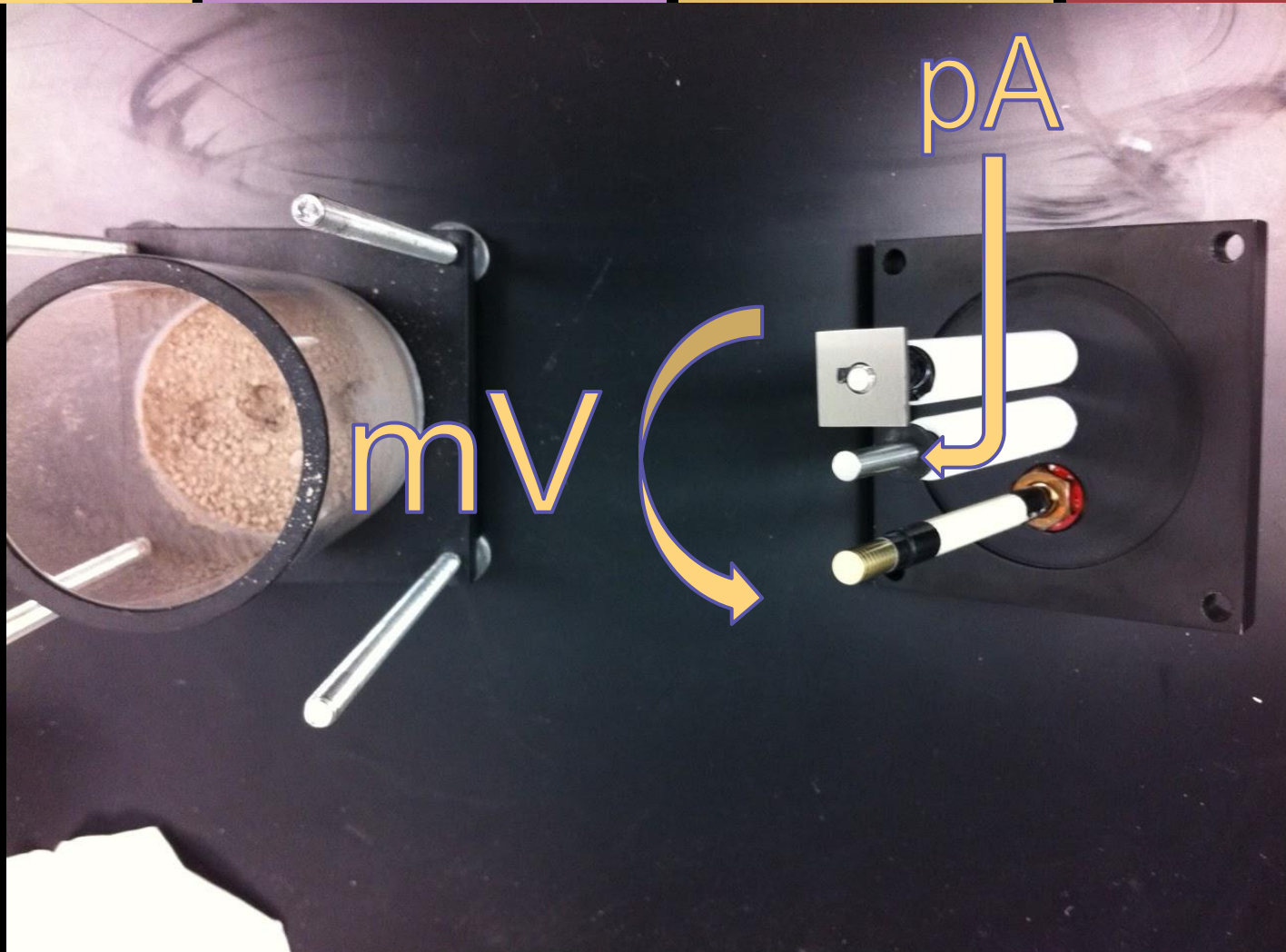
Yeah it can do that

- *Galvanostatic EIS?*

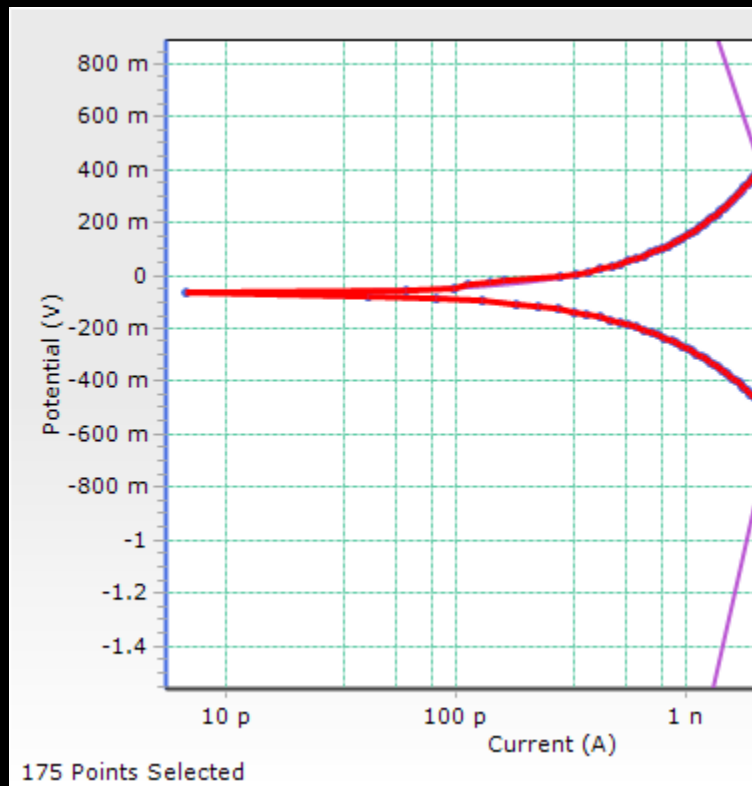
Check



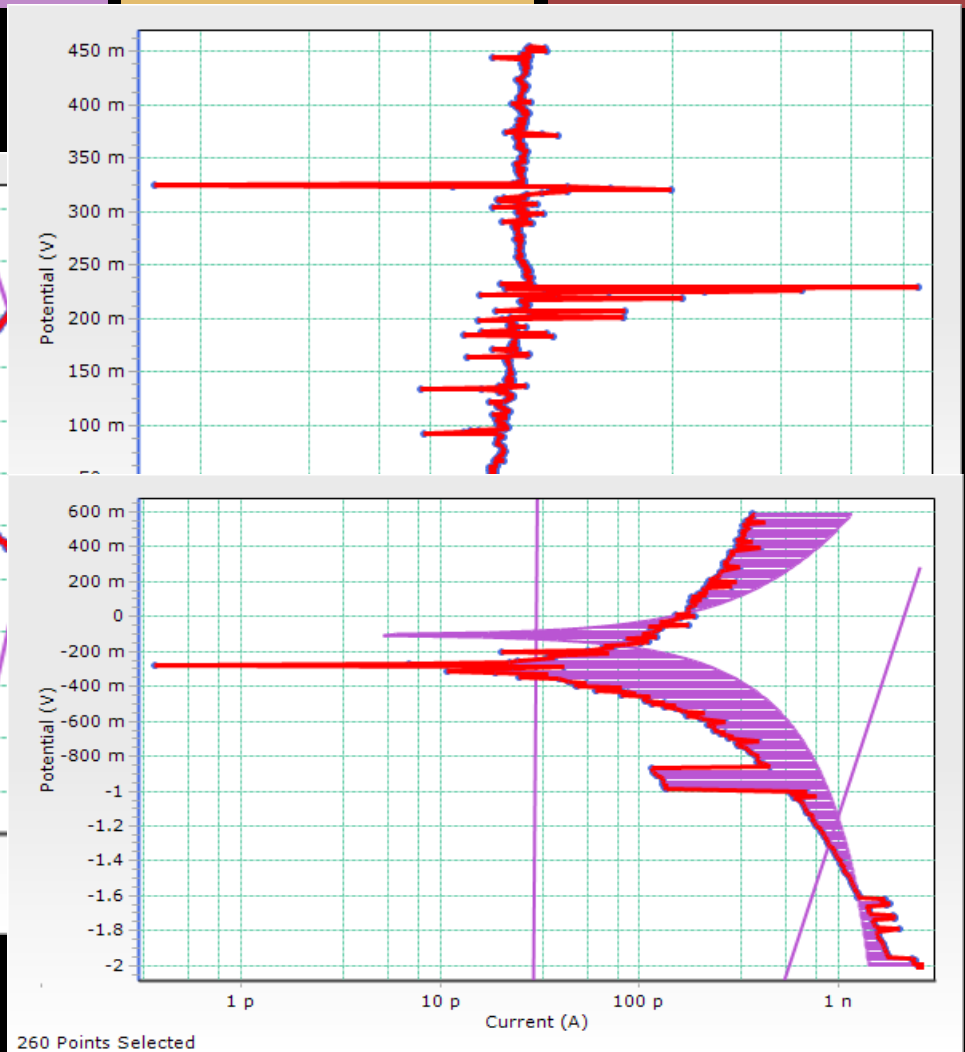
How Potentiodynamic Polarization Works



Ideal



Reality



Troubleshooting: Machining New Electrodes

Making friends at the
machine shop...



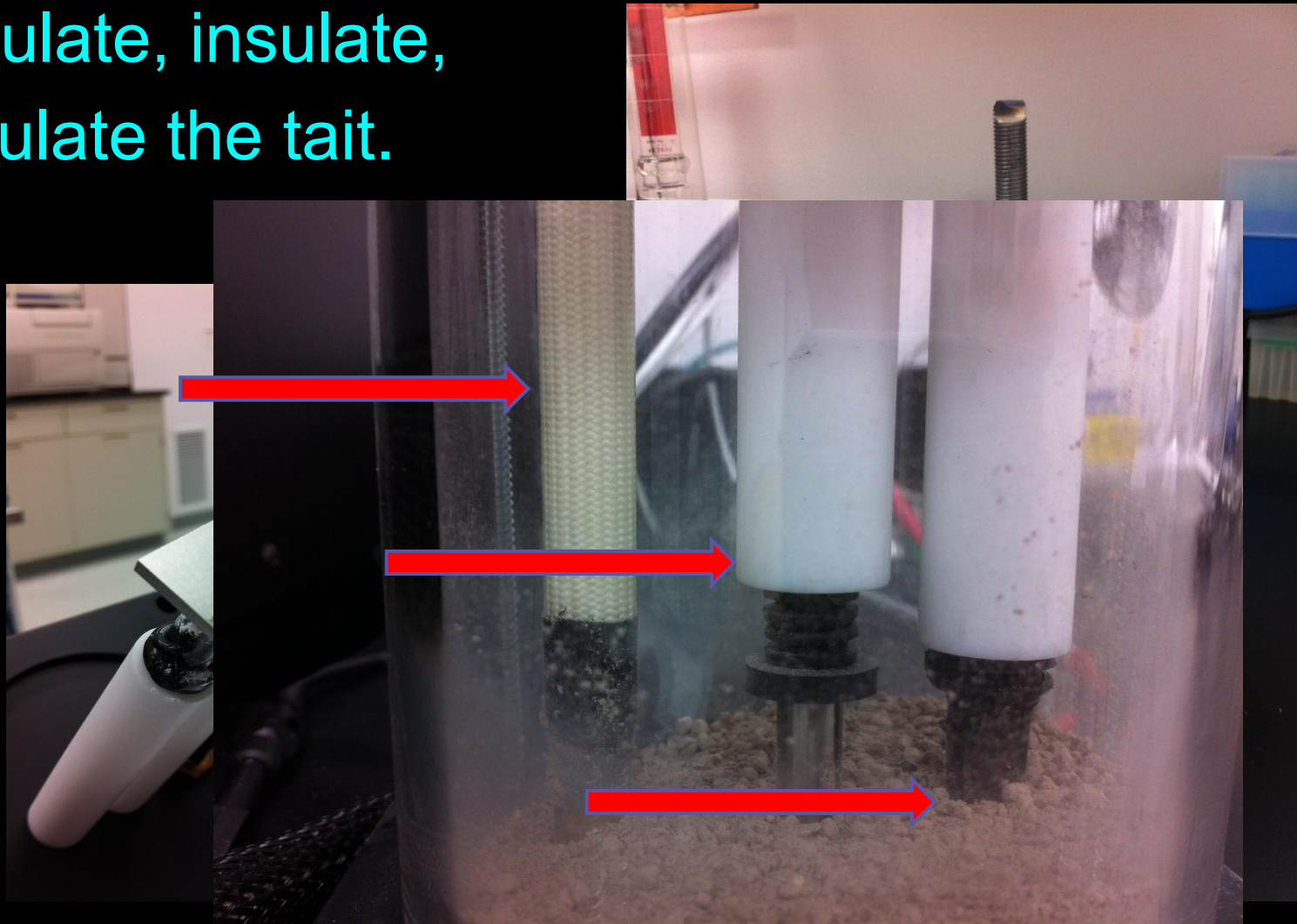
Ionizing!

Get rid of static....



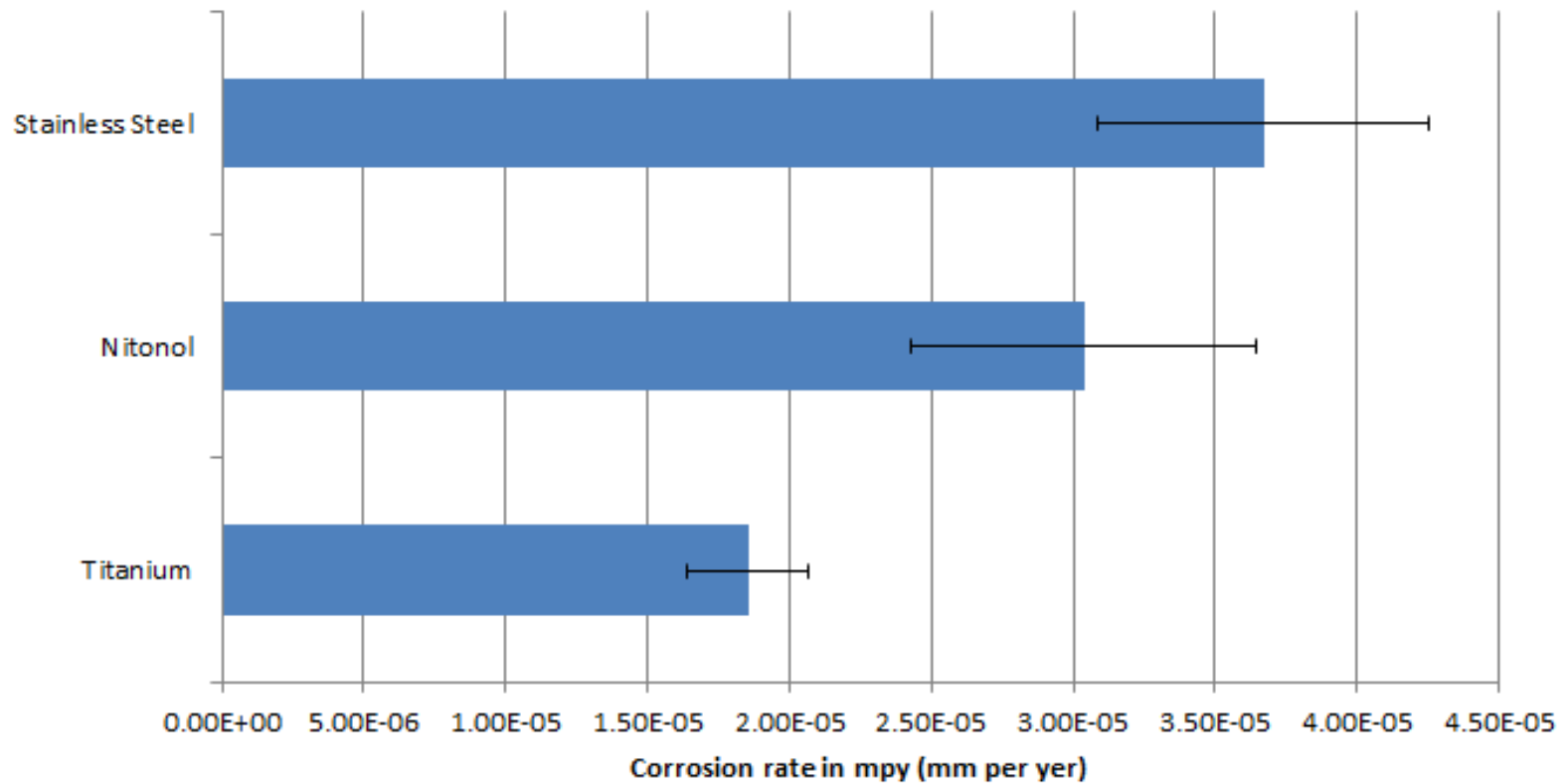
Insulating the Tait Cell

Insulate, insulate,
insulate the tait.



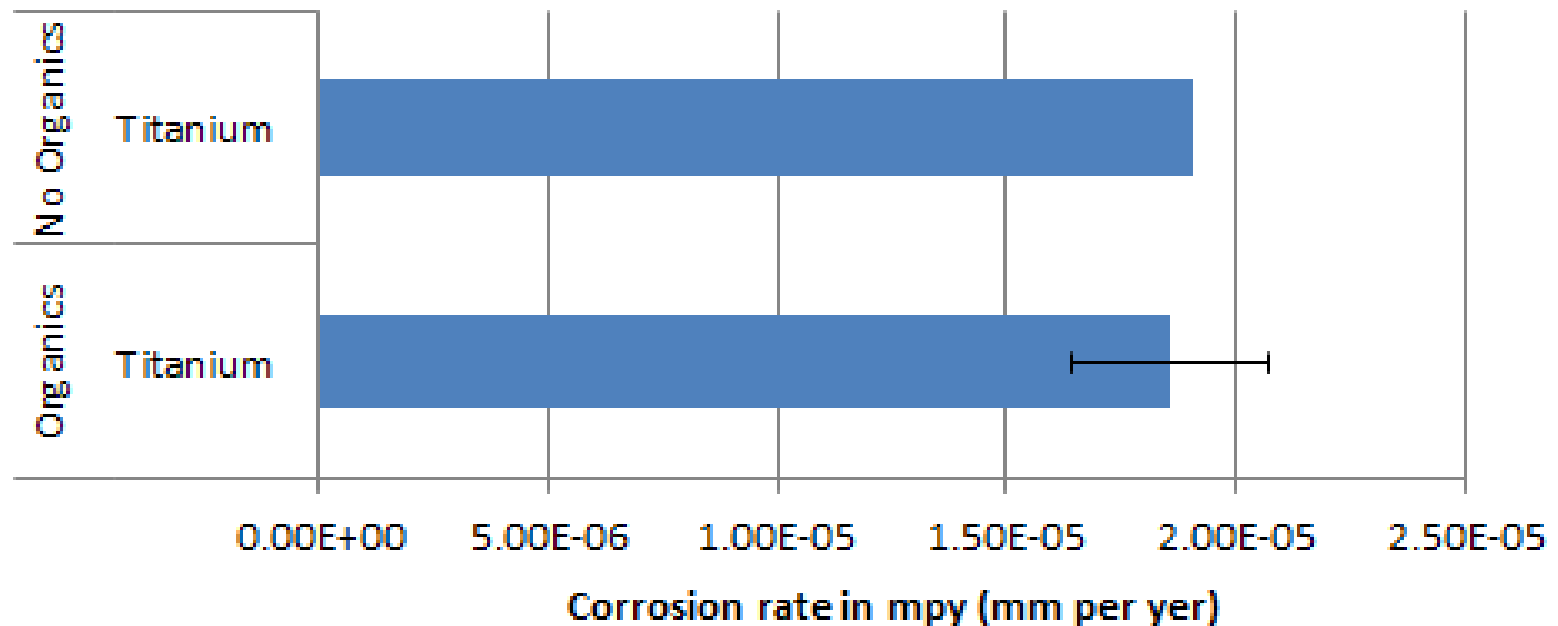
Results:

Corrosion Rate of Metals in
MRS (Mars Regolith Simulant)



Results:

Corrosion Rate of Titanium in MRS (Mars Regolith Simulant)



Discussion/Implications

Extremely low corrosion rates in candidate materials.

Small to no interaction between materials and possible organics.

This research is beneficial to the progress of the 2020 Mars Mission and future MSR (Mars sample Return) Mission.

Acknowledgments



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