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Dep. of Materials Chemistry  
Uppsala University, Sweden

## Corrosion of Copper in oxygen free water Report 2012-04-10

### KOPPARS KORROSION I ULTRARENT VATTEN

#### SKB Delrapport 2012-04-10

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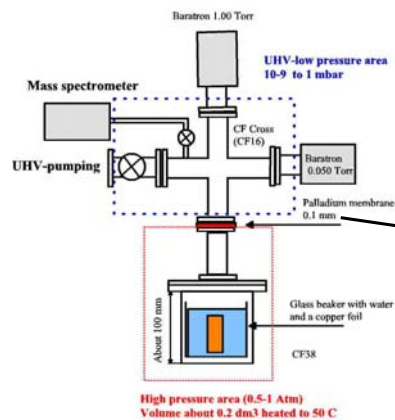


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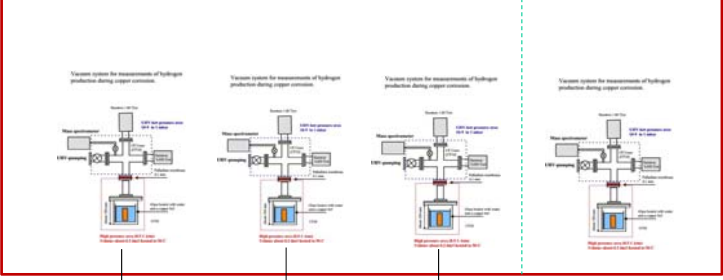
## Corrosion of Copper in oxygen free water Experimental set-up

Vacuum system for measurements of hydrogen production during copper corrosion.

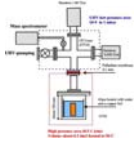


**Corrosion of Copper in oxygen free water  
 Hydrogen continuous measurements**

Glove box



Outside glove box



Pure H<sub>2</sub>O + heat  
Treated Cu

Pure H<sub>2</sub>O +  
grinded Cu

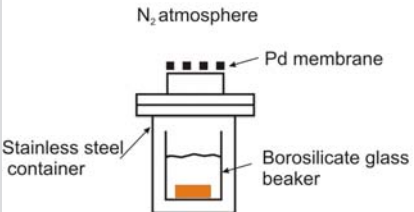
Pure H<sub>2</sub>O  
Duran (blank)

Set-Up outside  
box

About 100 cm<sup>2</sup> of Cu in each set-up

**Corrosion of Copper in oxygen free water  
 Experiments corrosion products**

Parallel experimental arrangements



- Water and 32 cm<sup>2</sup> Cu – 1 month
- Water and 32 cm<sup>2</sup> Cu – 2 month
- Water and 32 cm<sup>2</sup> Cu – 3 month
- Water and 32 cm<sup>2</sup> Cu – 6 month
- Water and 32 cm<sup>2</sup> Cu – 12 month
- Water and 32 cm<sup>2</sup> Cu – 1 month
- Water and single crystal Cu – ? month
- Water and 32 cm<sup>2</sup> Cu – long term
- Water and 32 cm<sup>2</sup> Cu – long term
- Water soda glass – ? Month

More parallel experiments available

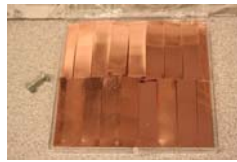


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## Corrosion of Copper in oxygen free water Cu substrates - Summary

- Milling to divide large sheet into smaller substrates
- Electropolishing
- H<sub>2</sub> reduction of Cu-oxides in UHV furnace
- Heat treatment in UHV atmosphere



According to ERDA very clean surface.  
NRA will be performed 24/5

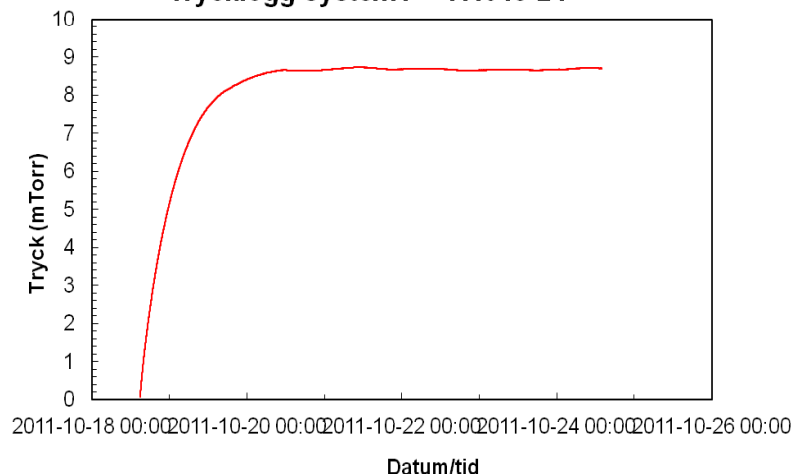


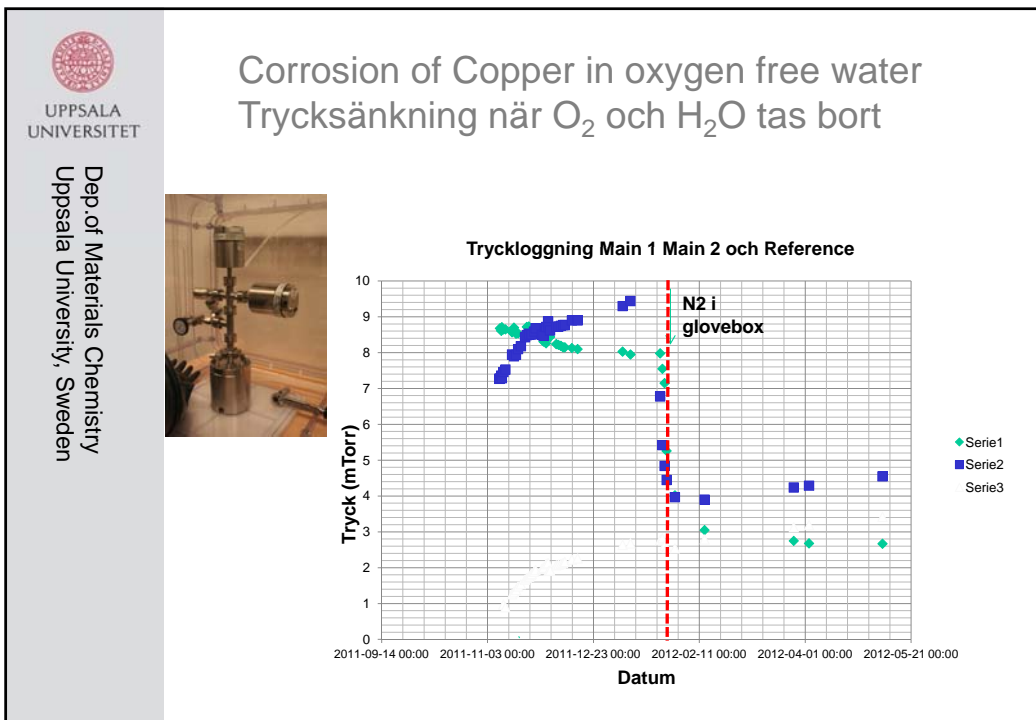
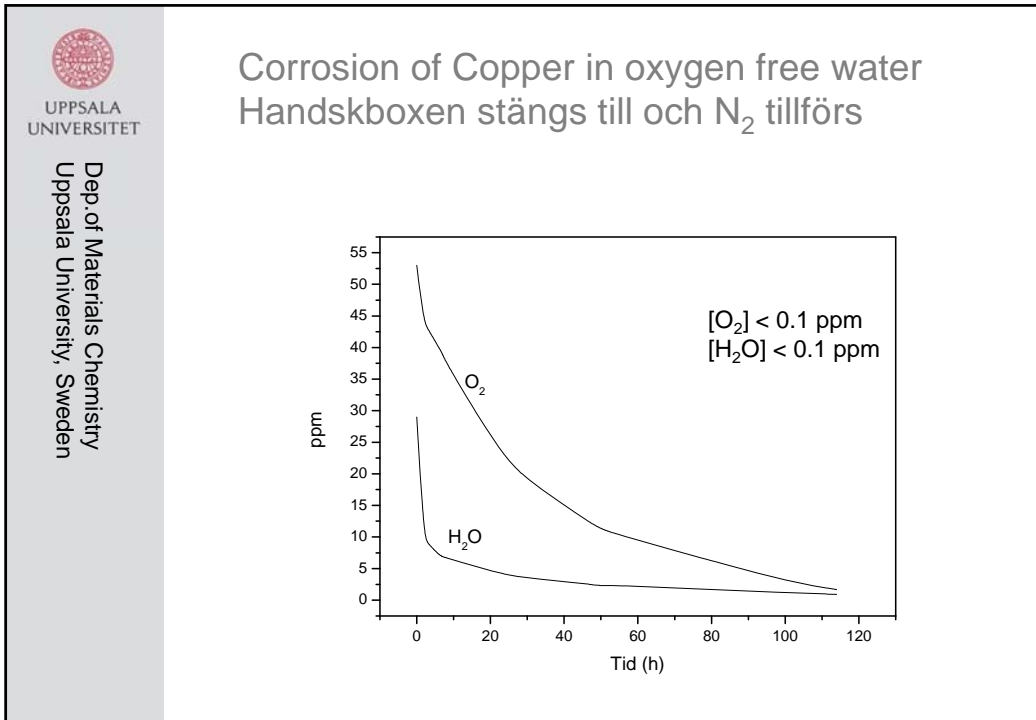
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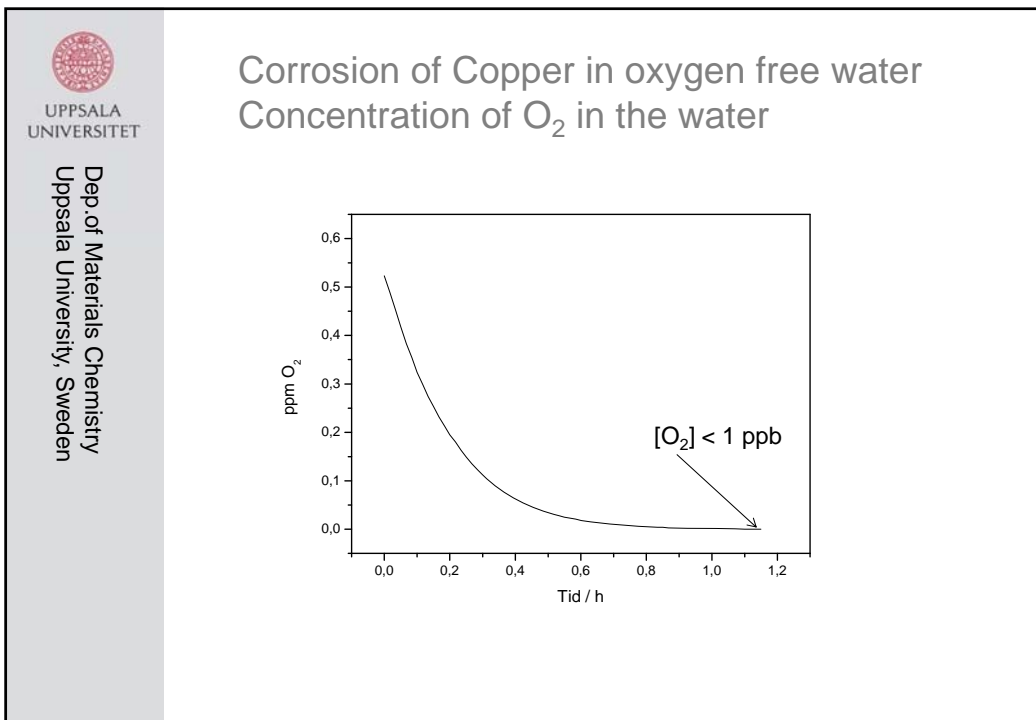
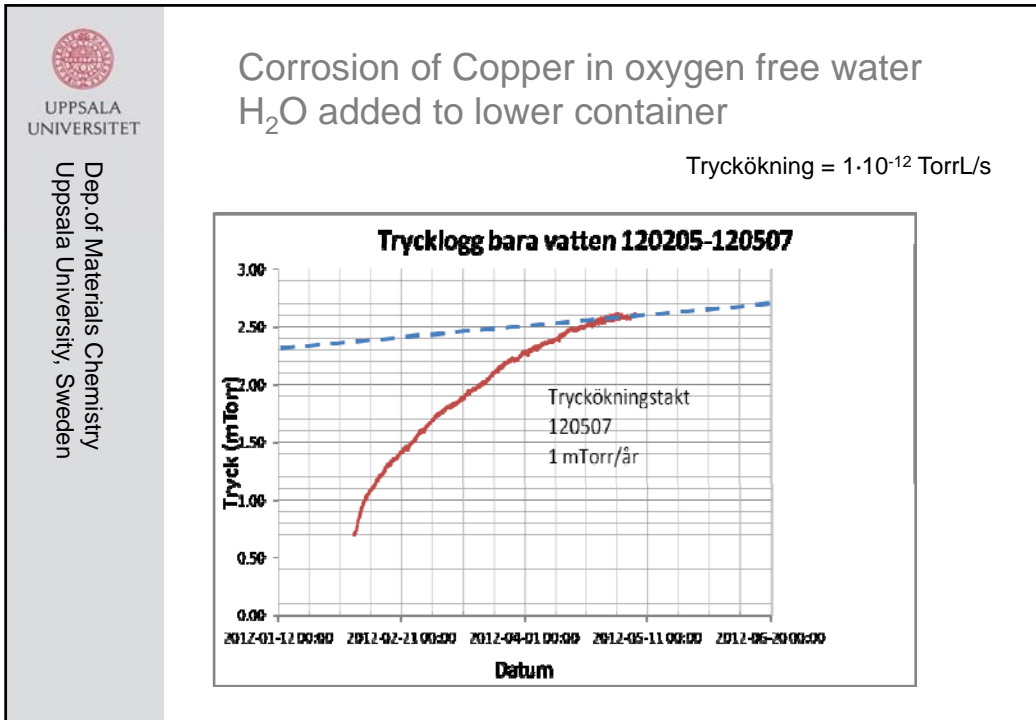
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## Corrosion of Copper in oxygen free water Pressure measurements. Stability after bake out

Trycklogg system1 111018-24









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## Corrosion of Copper in oxygen free water Evaluation of experiments

First experiment will be stopped and evaluated 24/5.

NRA of Cu and Pd - amount of H<sub>2</sub>

XPS of Cu - all elements on the surface

ICP-MS - concentration of elements in water (+ glass)

SEM (AFM)

IR spectroscopy ?