

Refining the Reference Capabilities of an Ion Selective Electrode

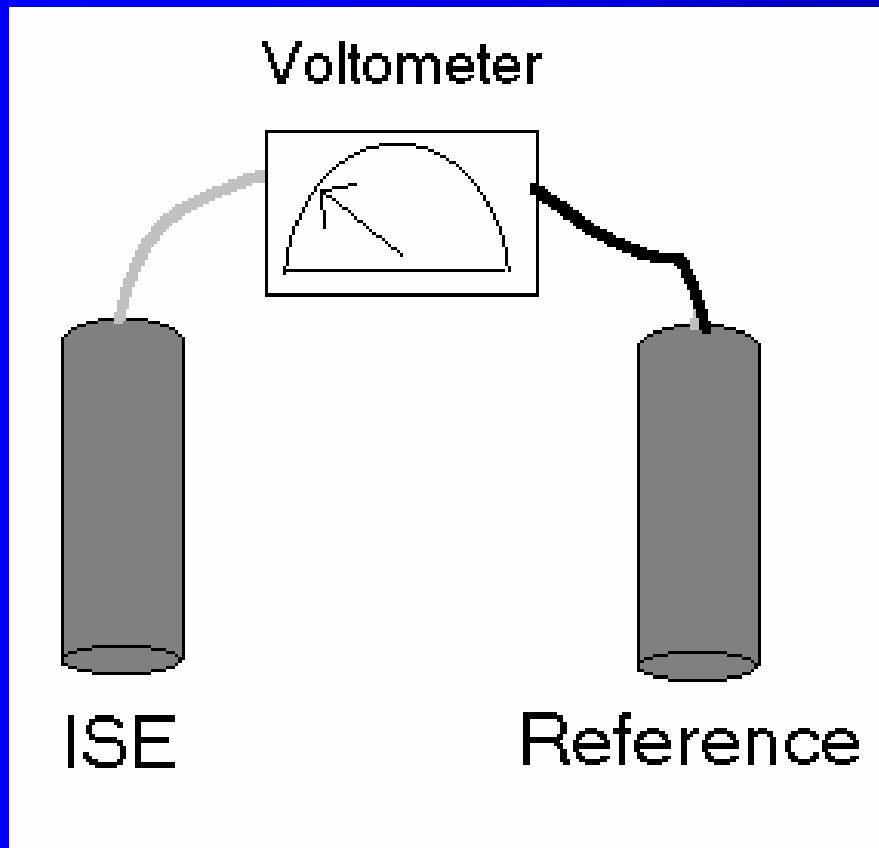
Xiaofan Yang

Thomas Jefferson High School for Science and Technology

Dr. David Kidwell

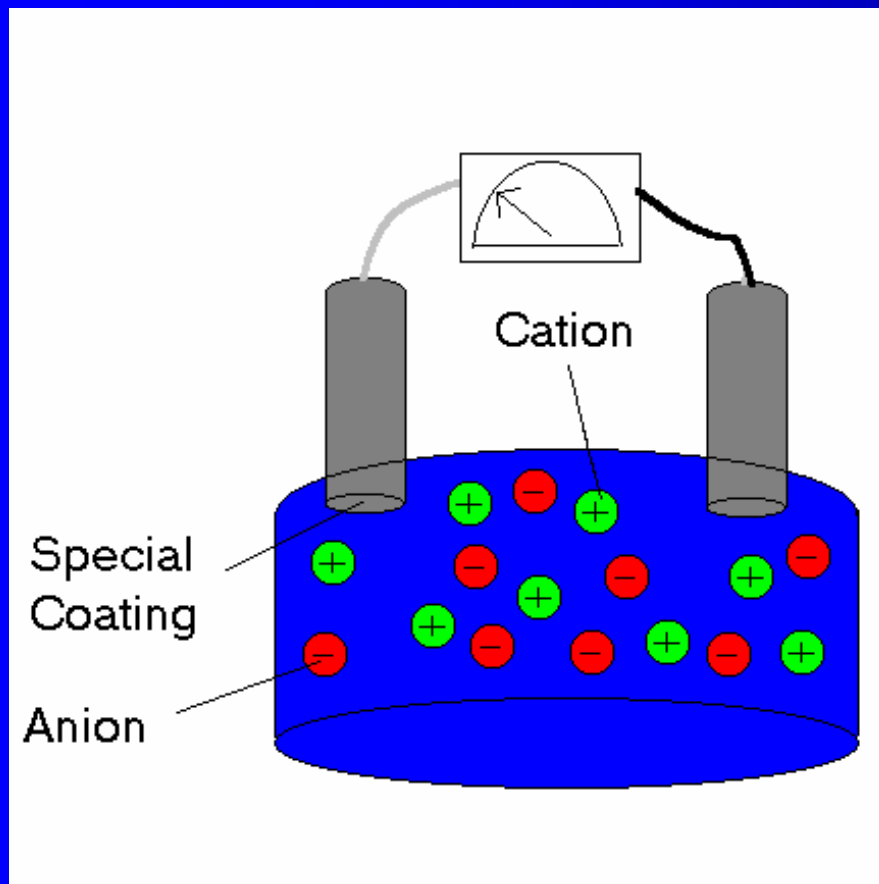
Naval Research Laboratory

Ion Selective Electrode (ISE)



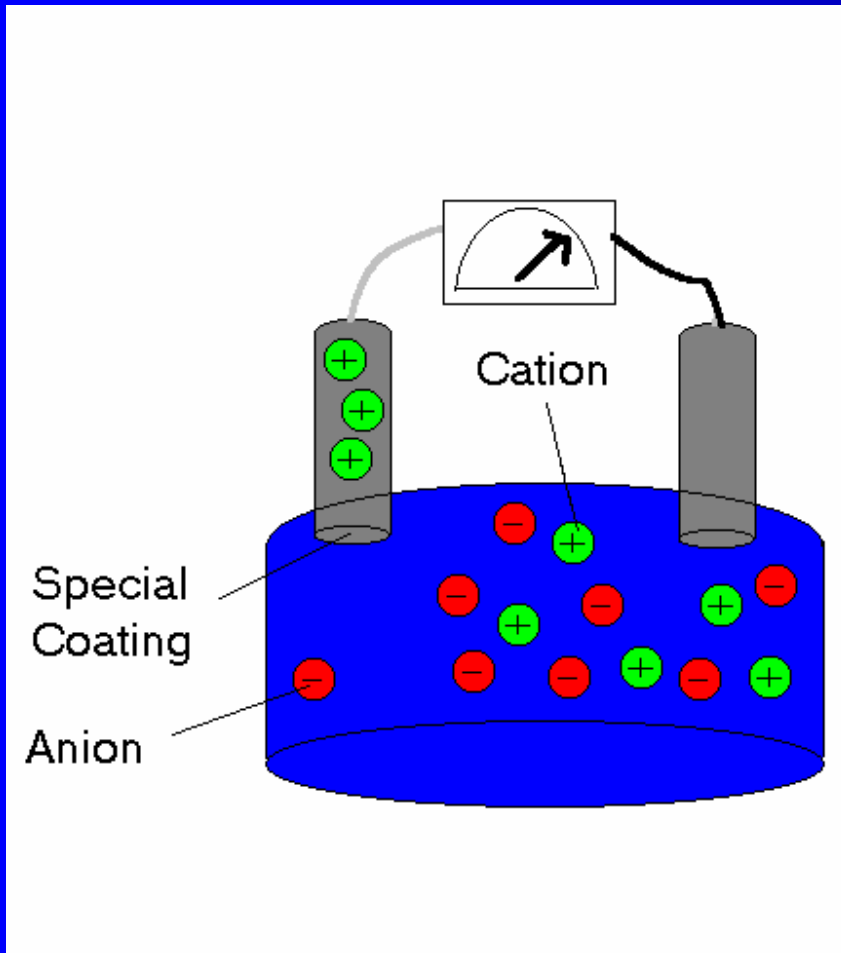
- Two half-cells
 - Selective
 - Responsive to one ion
 - Reference
 - Ag/AgCl

Ion Selective Electrode(ISE)



- Selective Coating permeates one type of ion
- Ion permeation gives voltage offset

Ion Selective Electrode(ISE)



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Uses for Ion Selective Electrodes

Water control/ pollution detection

Agriculture

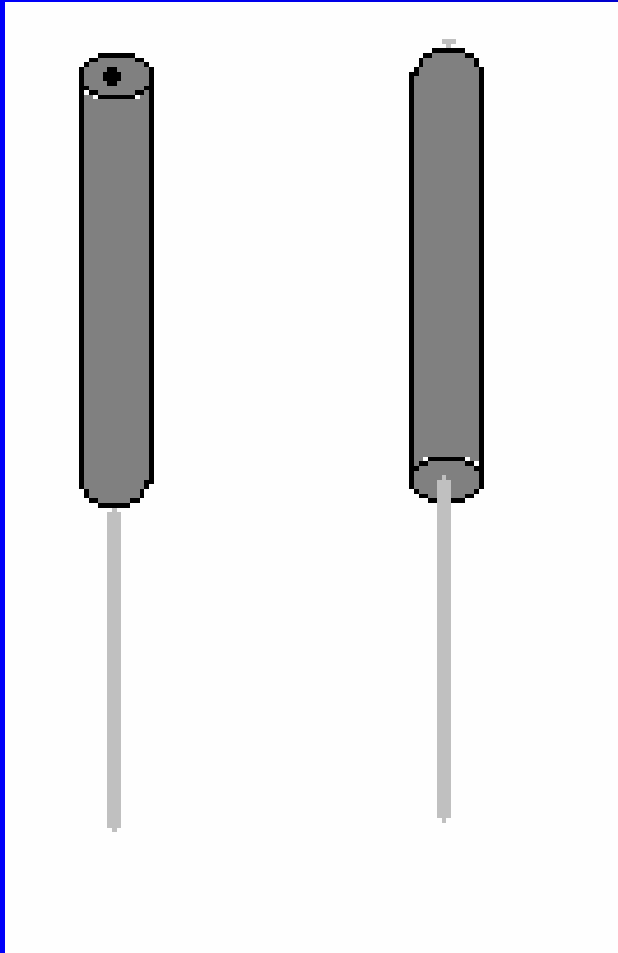


Explosives



Food- preservation/processing/eating

Reference Electrode



- Why make it better?
 - Potential difference
 - Used in all half-cells

Construction

ASSEMBLY

Construction

Obtain a rod of poly vinyl chloride



Construction

Mill the rod into smaller pieces.



Construction

Mill the rod into smaller pieces.



Construction



Construction



Construction



Construction



Construction



Construction

Drill all the way through from center.



Construction



Construction



Construction



Construction



Construction

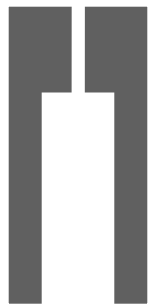


Construction

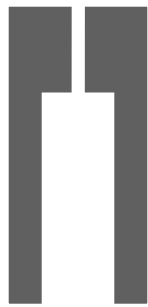
Drill 3/4th through from other side.



Construction



Construction



Poly ethylene glycol

Construction

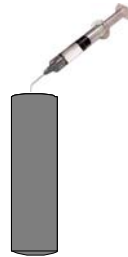


Construction

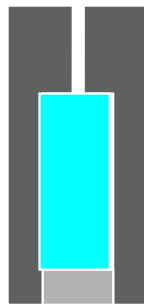


Saturated Potassium Chloride

Construction



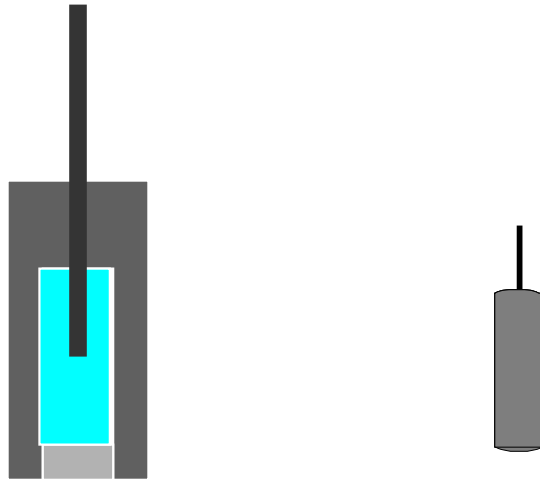
Construction



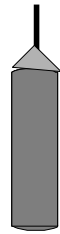
Silver Wire



Construction



Construction



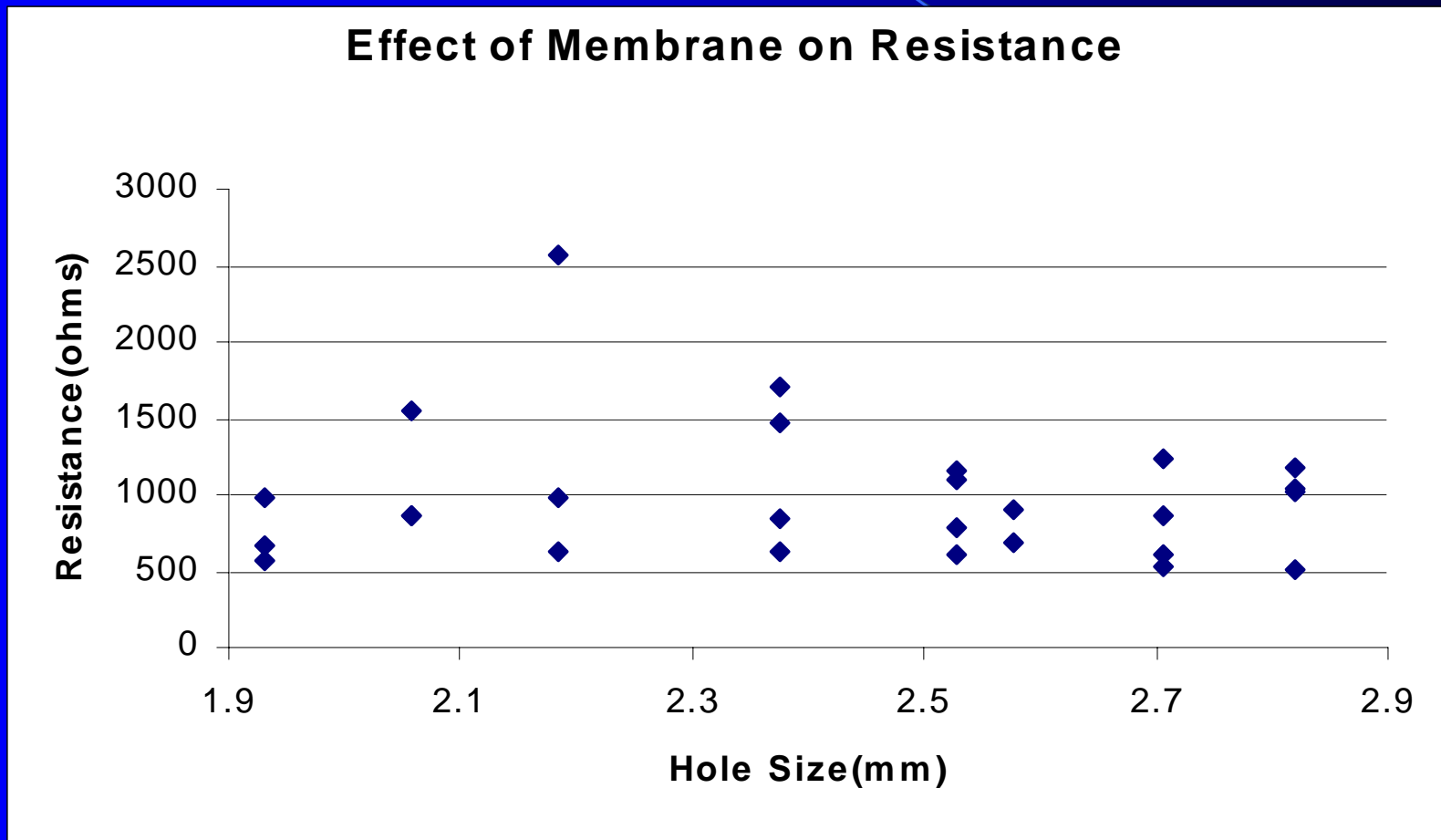
Epoxy

Optimization

- What has been tested?
 - Assorted hole sizes
 - Various membrane thicknesses
 - Different epoxy coatings
 - Durability
 - Multiple membrane solutions



Results



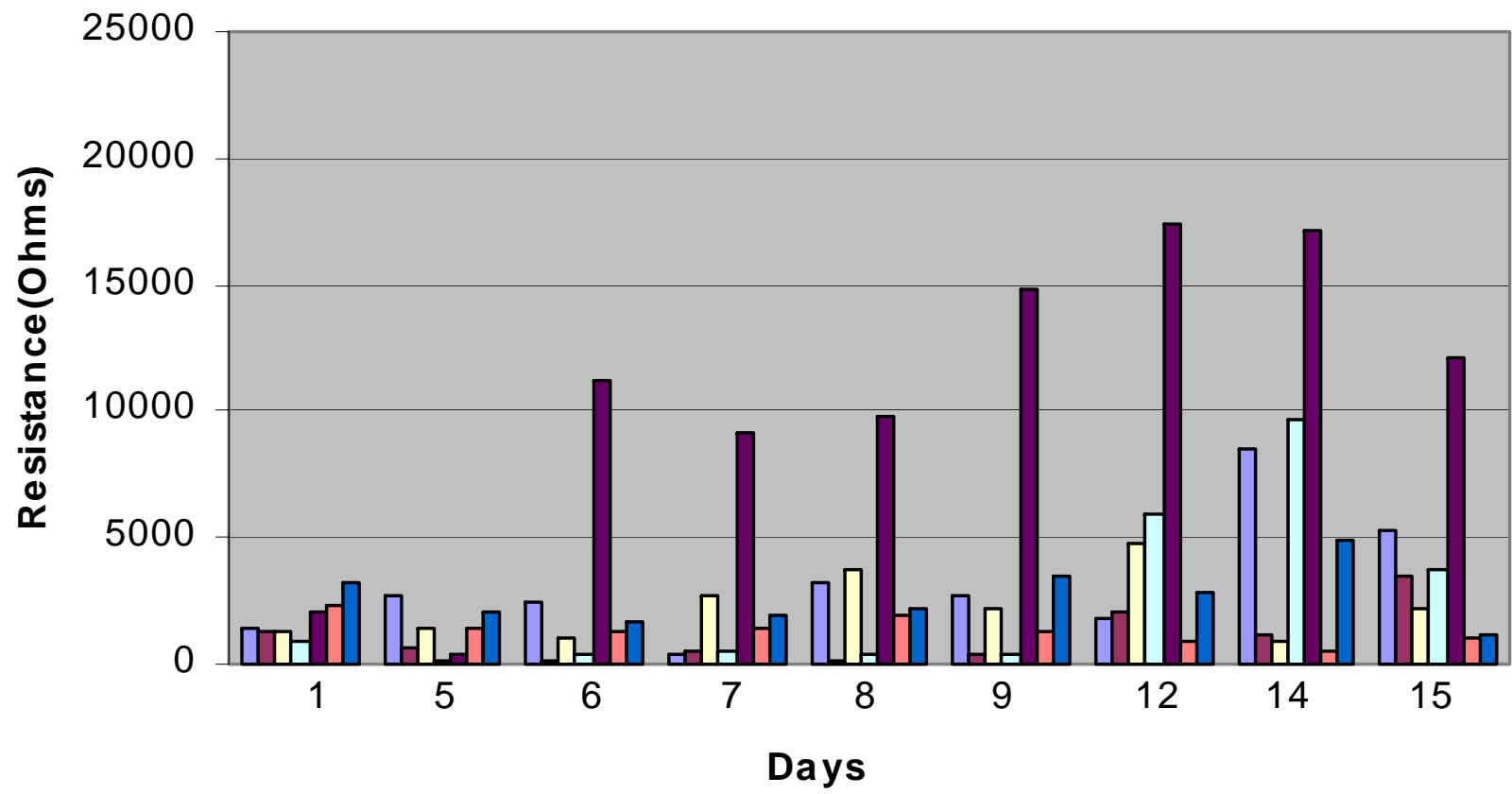
Optimization

- What has been reviewed?
 - Assorted hole sizes



Results

Resistance of 40 μ L PEG Electrode



Optimization

- What has been reviewed?
 - Assorted hole sizes
 - Various membrane thicknesses



Epoxy Results

- 8005 white Scotch epoxy-18/28 work=64%
- 270 black Scotch epoxy- 22/27 work=81%
- 420 black Scotch epoxy-42/47 work=89%
- Epoxy strengths(strongest to weakest)

- 420
- 270
- 8005



Optimization

- What has been reviewed?
 - Assorted hole sizes
 - Various membrane thicknesses
 - Different epoxy coatings



Durability

- Average life expectancy of 2-3 weeks
 - Evaporation
 - Membrane malfunction

Optimization

- What has been reviewed?
 - Assorted hole sizes
 - Various membrane thicknesses
 - Different epoxy coatings
 - Durability



Membrane Mixtures

- 2 HPVC: 1 PEG-- not viscous
- 1 HPVC: 1 PEG-- high resistance
- 1 HPVC: 2 PEG-- low resistance

Optimization

- What has been reviewed?
 - Assorted hole sizes
 - Various membrane thicknesses
 - Different epoxy coatings
 - Durability
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Acknowledgements

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Matthew C. Kinney

THE END