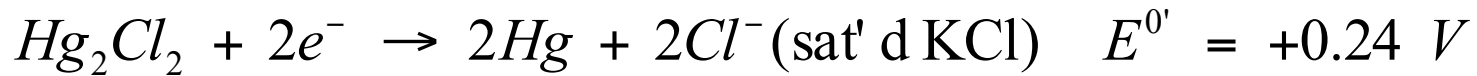
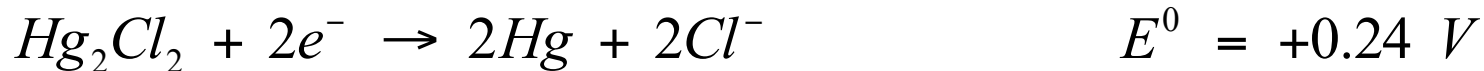


Reference electrode

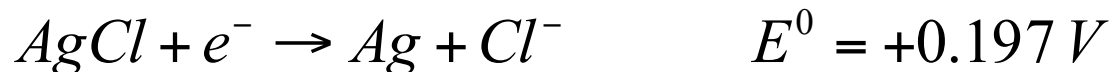
- SHE not very practical as reference
- Prefer a half cell that is stable and easily made to produce same E^0 or E^0'

Example:

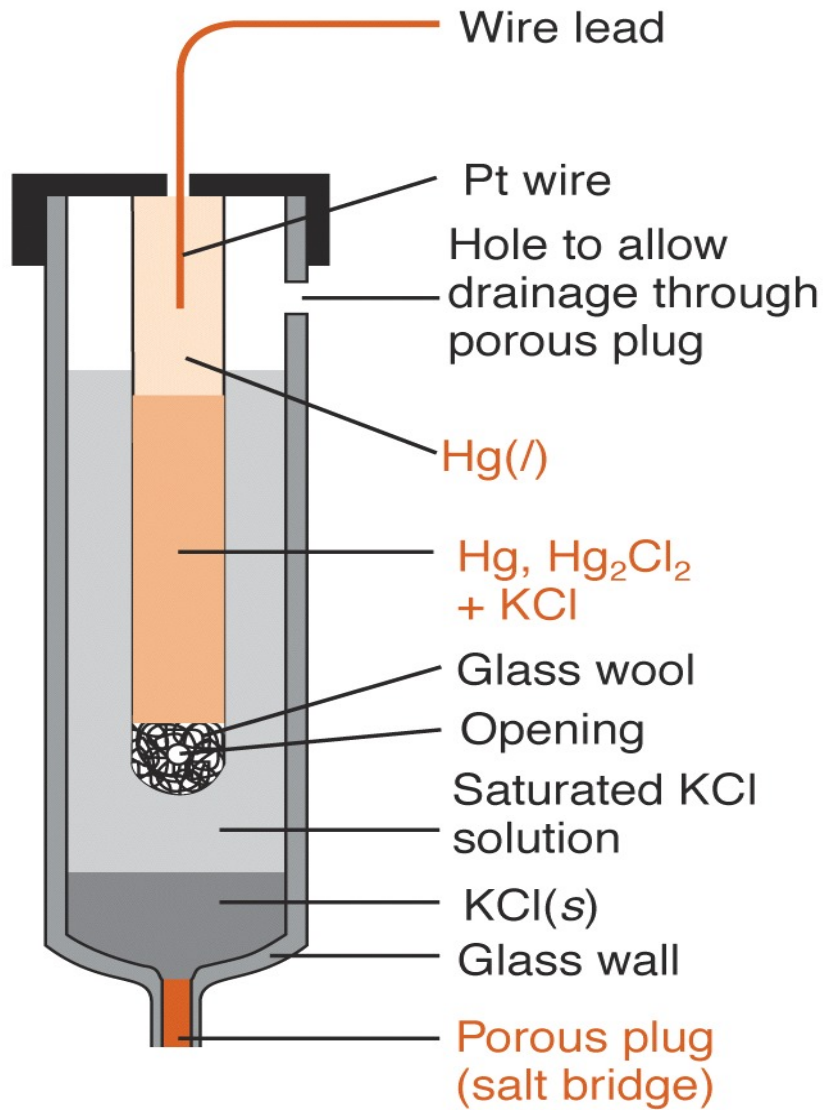
$\text{Hg}_2\text{Cl}_{2(s)} \mid \text{Hg}_{(l)} \mid \text{KCl (sat'd)}$ “Saturated calomel electrode” (SCE)



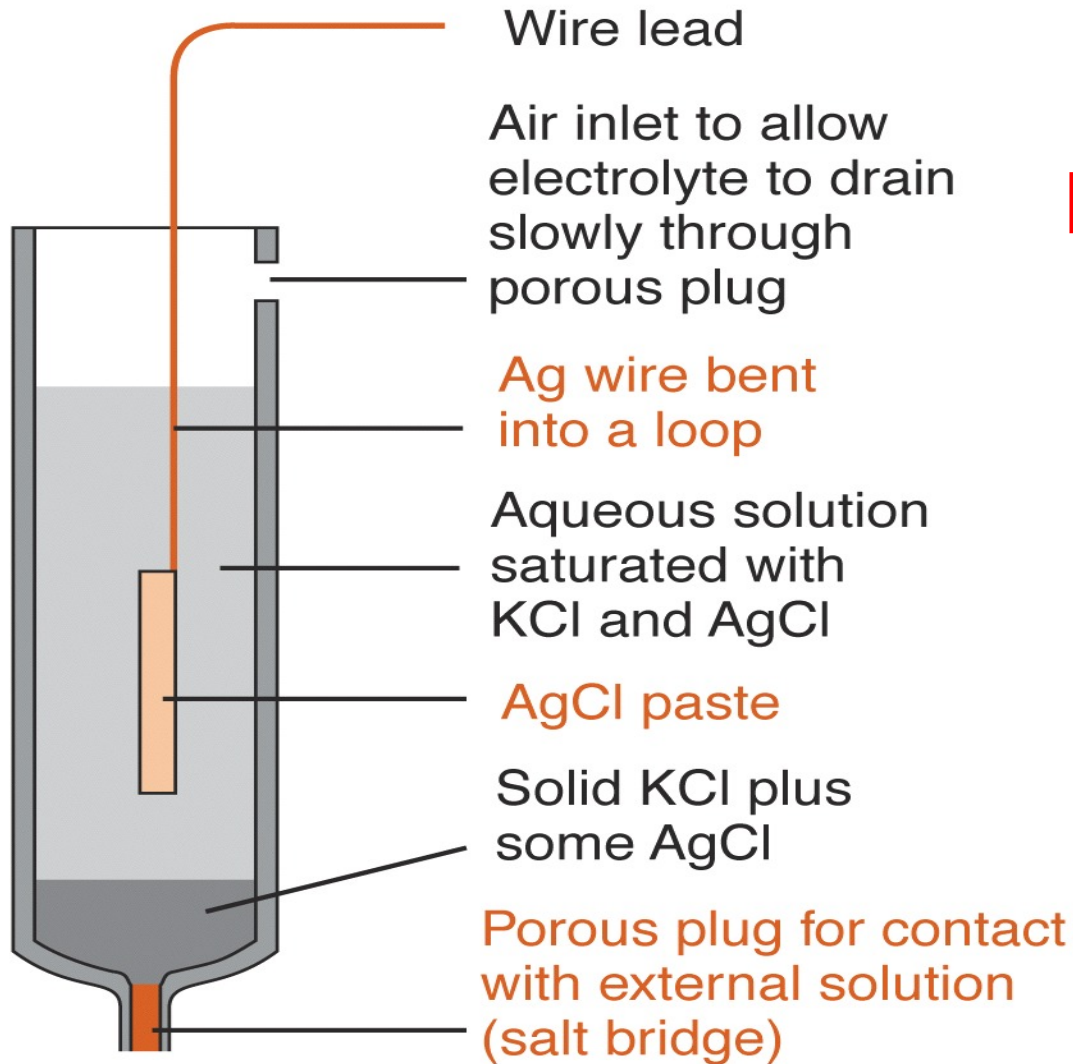
$\text{AgCl}_{(s)} \mid \text{Ag}_{(s)} \mid \text{KCl (sat'd)}$ “Silver-silver chloride electrode”



SCE Ref electrode



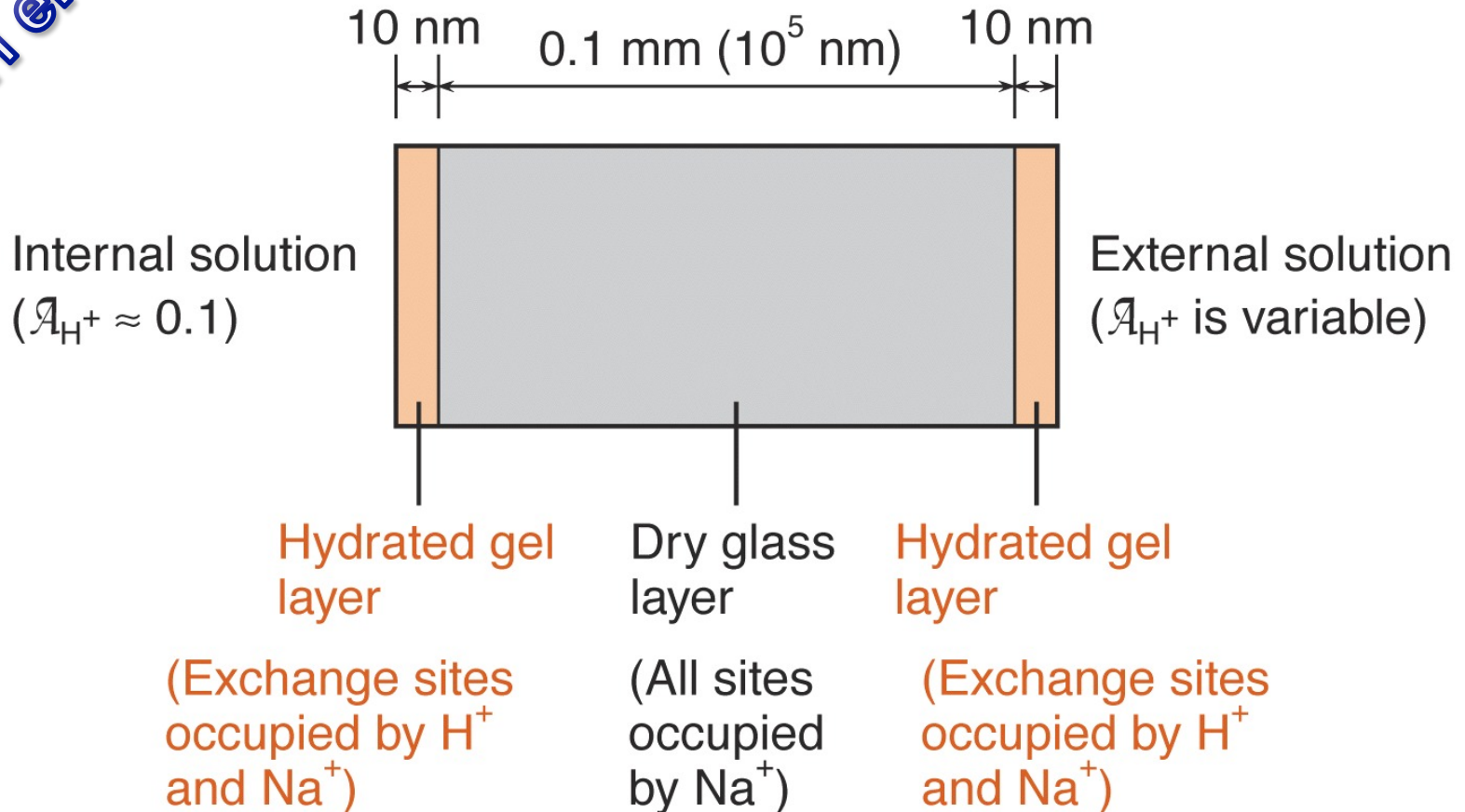
Ag/AgCl Ref electrode





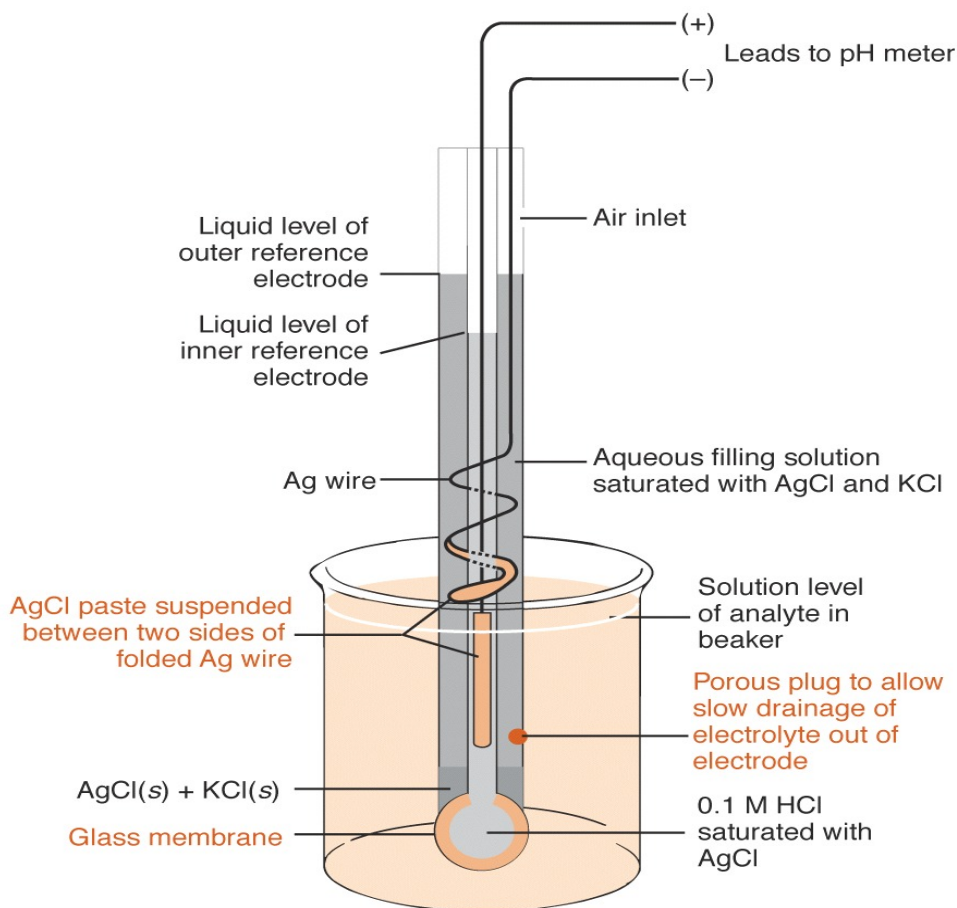
pH electrode

Hydrated gel layer





Voltage drop across this membrane because of difference in $[\text{H}_3\text{O}^+]$ on either side

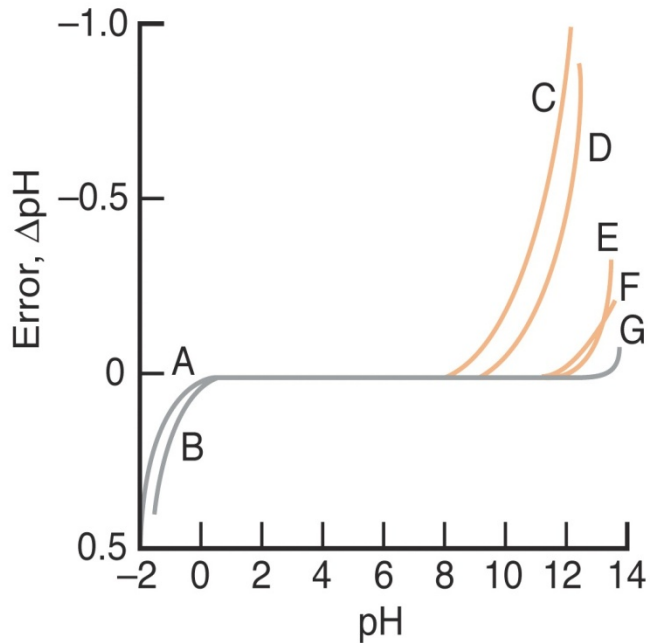
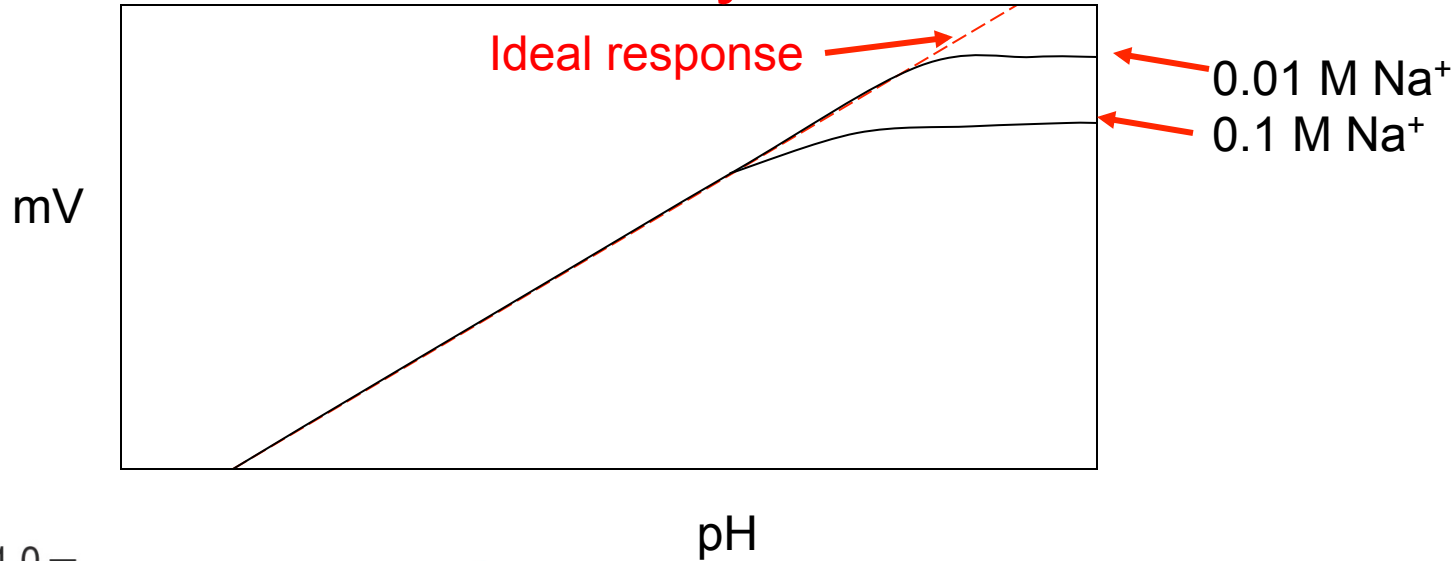


$$E = E_{\text{ref}} - 0.0592 \log \frac{[\text{H}^+](\text{var})}{1.0}$$

Recall: $-\log([\text{H}^+]) = \text{pH}$

$$E = E_{\text{ref}} + 0.0592 (\text{pH})$$

Alkalinity error

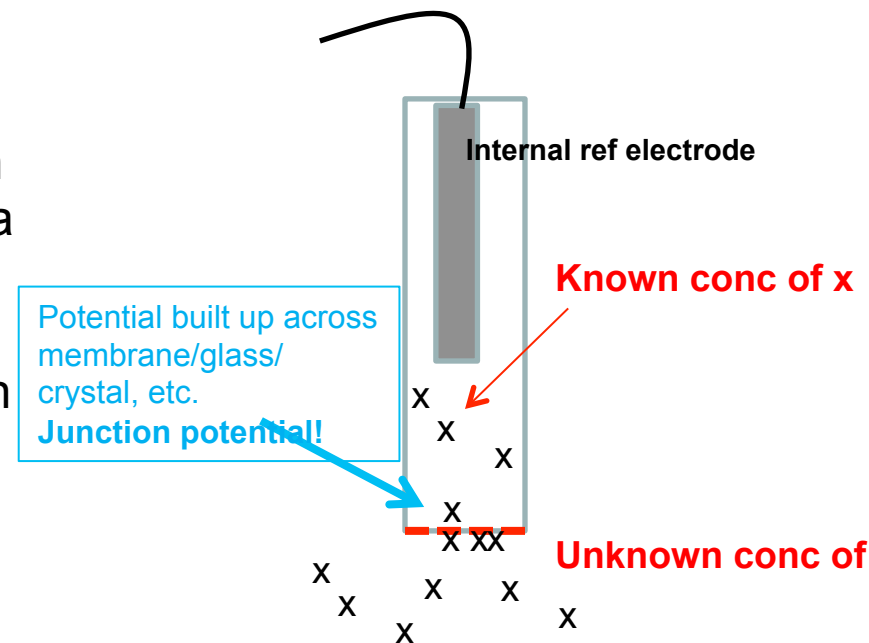


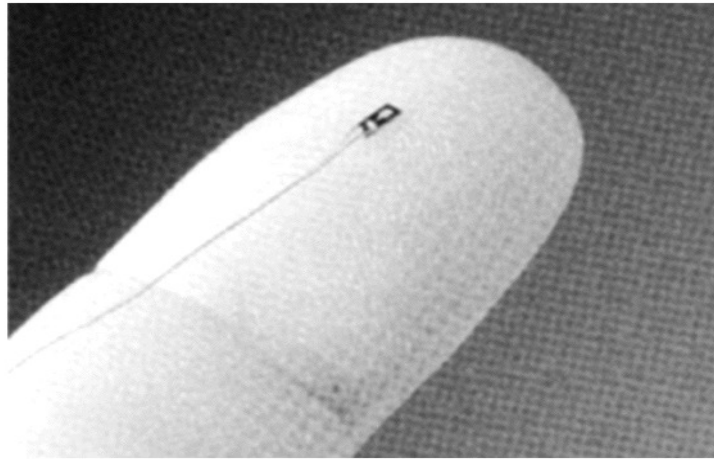
- A: Corning 015, H_2SO_4
- B: Corning 015, HCl
- C: Corning 015, 1M Na^+
- D: Beckman-GP, 1M Na^+
- E: L&N Black Dot, 1M Na^+
- F: Beckman Type E, 1M Na^+
- G: Ross Electrode

Ion selective electrodes

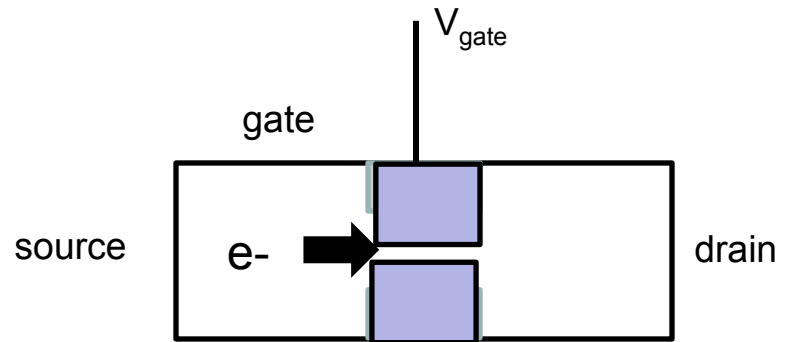
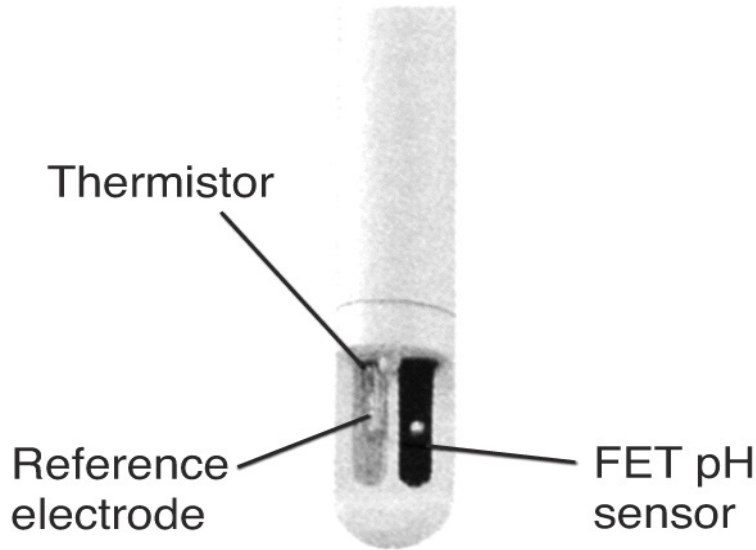
Example: With the proper glass, the pH-type electrode can be made to be selective to other cations, such as Na^+ , K^+ , etc.

In general, we can get selective if we can make a boundary that has specificity for a given species so that we can set up a concentrations gradient across that interface. Electrode **selectivity** based on selectivity of interface material.





Many other interesting micro-electrodes are of current interest. Electrode areas can get down to sub-micron sizes (<0.001 mm). (Although most are not used in potentiometric mode of operation.)



FET (field effect transistor)