Background
Tooth decay is caused by demineralization in acidic conditions.

Opportunity
This research focuses on creating pH sensing ultramicroelectrodes (UME) used in scanning electrochemical microscopy (SECM) for high resolution pH mapping of local environments on biofilms.

Bioactive Glass
Bio-active glass releases calcium oxide to neutralize acidic environments, reducing harmful bacterial growth.

Electrode Design Goals
- Response time: <1 second
- Working range: pH 4 – 9
- Stability: 4+ hours

CH Instruments SECM device performing pH mapping of bio-active glass sample with a polyaniline modified UME.

Electrode Fabrication
Dual-Tip UME fabricated by sealing two 25 μm diameter platinum wires in boro-silicate glass pipette.

Polyaniline is a conductive polymer that can respond to pH.

Results
Calibration of pH sensing dual-tip in universal buffer solution. The slope and intercept of each fabrication varies slightly.

Nernst Equation provides theoretical basis for slope of an ion-selective electrochemical sensor.

Future Work
- Continued characterization of bio-active glass
- pH and morphology mapping of dental biofilms grown on bio-active glass

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References