

Electroanalytical Chemistry in the Bell Research Group

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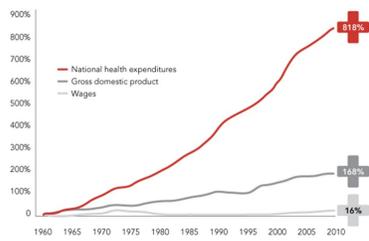


Problem

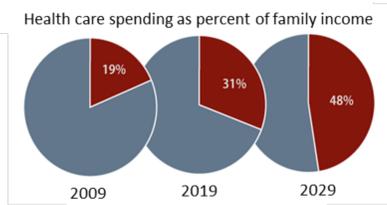
Healthcare in developing countries



Healthcare in the United States of America



Source: McKinsey, "Accounting for the Cost of U.S. Health Care" (2011). THE HUFFINGTON POST, Center for American Progress



Magneto-Electrochemistry

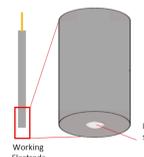
Electrochemistry:

- (i) Quantitative
- (ii) Fast
- (iii) Easily integrated with electronics

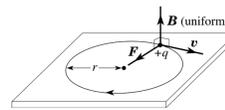
Magnetism:

- (i) External Force
- (ii) Low-cost
- (iii) Zero-energy

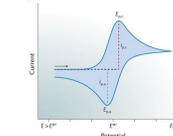
Reactive Surfaces



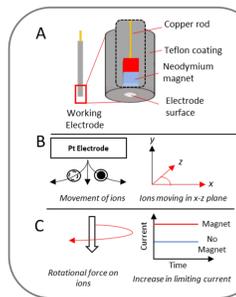
Lorentz Forces



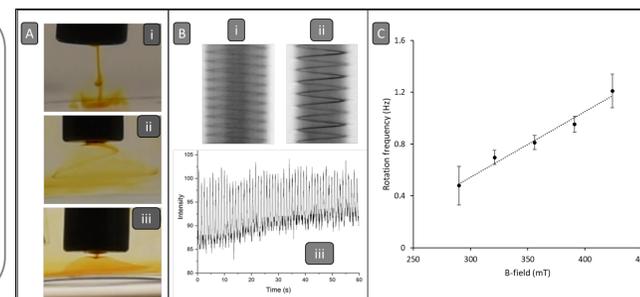
Electrochemical Potential



Magnetic Electrodes



Lorentz Forces



Point-of-Care Diagnostics

Bio-Terrorism



Human Healthcare



Pharmaceuticals



Point-of-Care Sensing



Companion Diagnostics



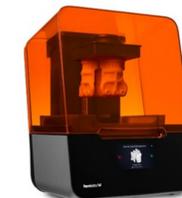
Veterinary Healthcare



Environmental

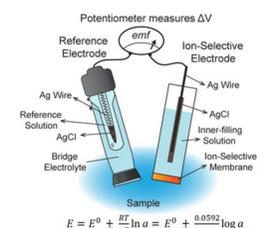
3D Printing:

- (i) Modifiable
- (ii) User-Friendly
- (iii) Mass Production Capabilities



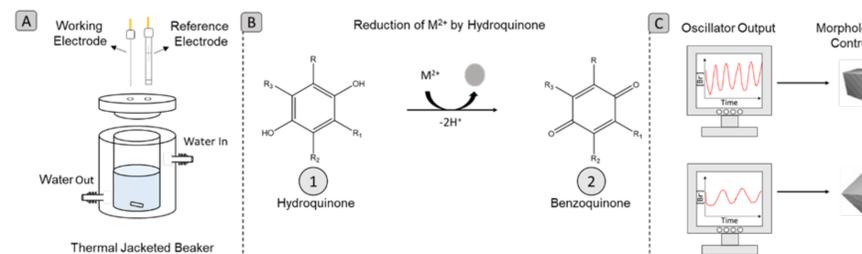
Potentiometry:

- (i) Selective
- (ii) Sensitive
- (iii) Fast response time

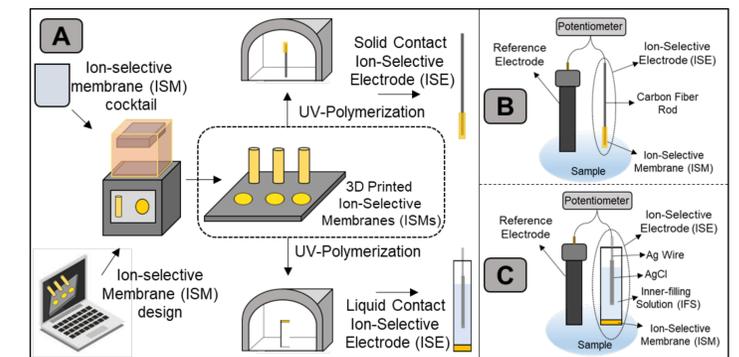


$$E = E^0 \pm \frac{RT}{zF} \ln a = E^0 \pm \frac{0.0592}{z} \log a$$

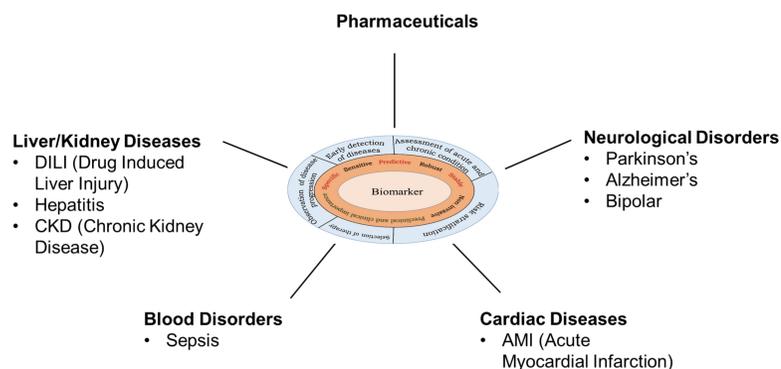
Self-Organization



Fabrication Scheme



Mobile Health



Liver/Kidney Diseases

- DILI (Drug Induced Liver Injury)
- Hepatitis
- CKD (Chronic Kidney Disease)

Neurological Disorders

- Parkinson's
- Alzheimer's
- Bipolar

Blood Disorders

- Sepsis

Cardiac Diseases

- AMI (Acute Myocardial Infarction)

Complex Biological Fluids

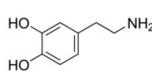
Blood

Urine

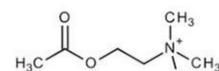
Sweat

Saliva

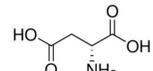
Diverse Health Biomarkers



Redox-Active



Redox-Inactive



Chirality

