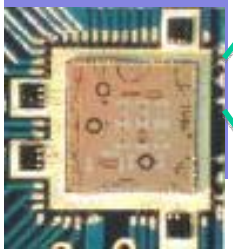
Tailoring Energy Storage Using Direct Write Printing Methods

Christine Ho, Jay Keist, Ba Quan, Jim Evans, Kazuhiro Murata, and Paul Wright

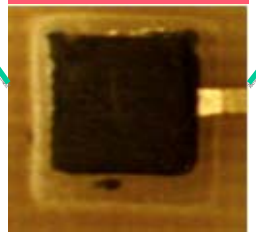
Energy Storage for Wireless Sensors

Radio, sensor, etc…

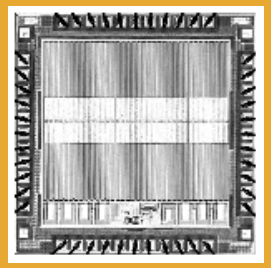


Capacitor

Battery



Power Conditioning



Energy Scavenger

Battery: 3.5mAh/cm^2 and 5mWh/cm^2
Capacitor: >2mW pulses.

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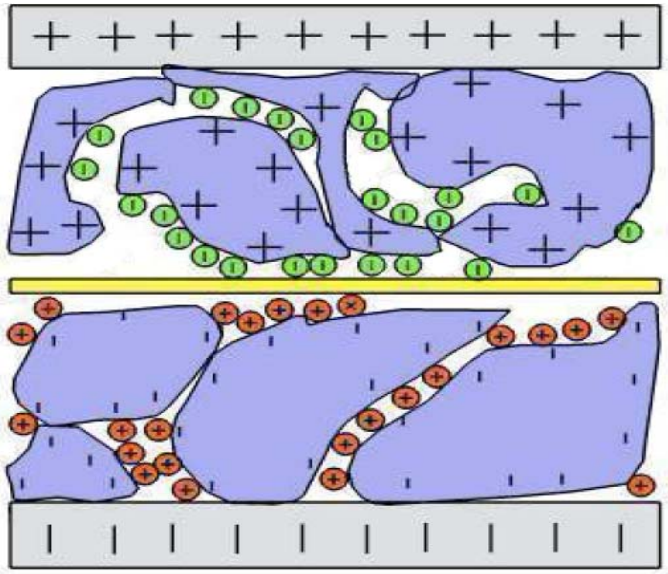
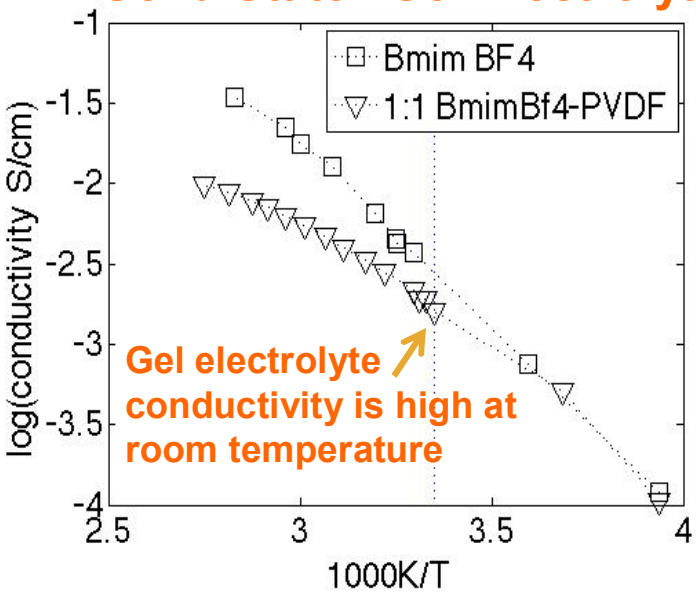
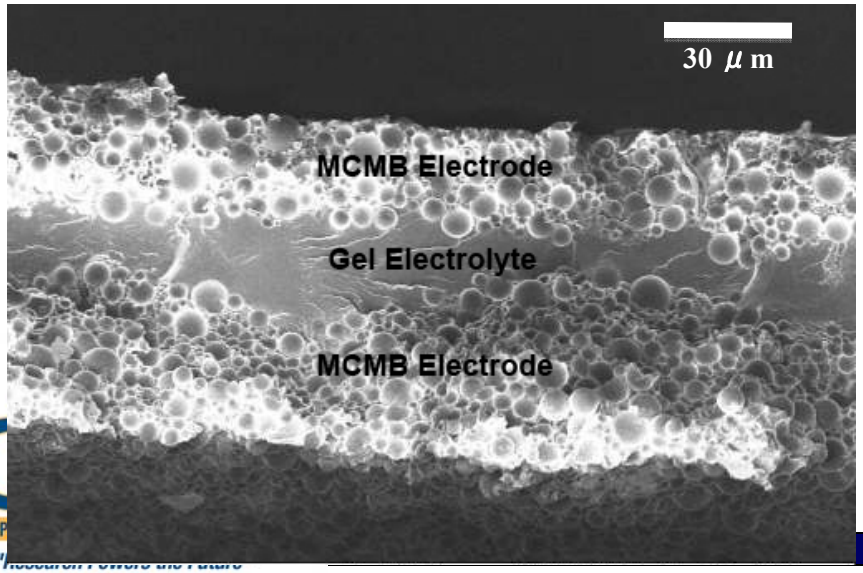
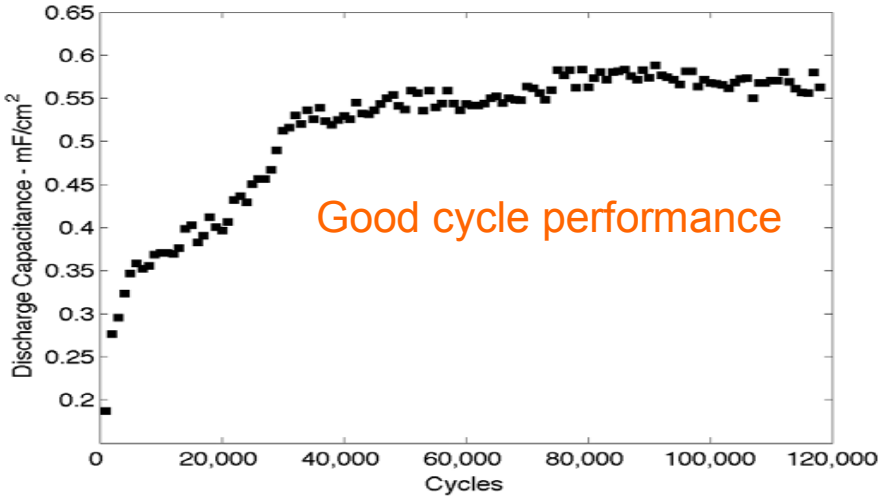
Solid State Electrochemical Capacitors



"Solid State" Gel Electrolyte



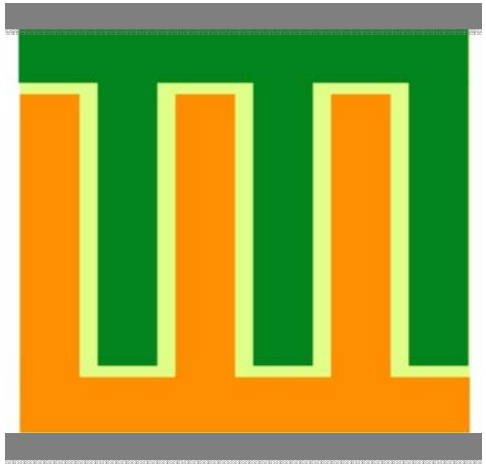




3D Microbatteries

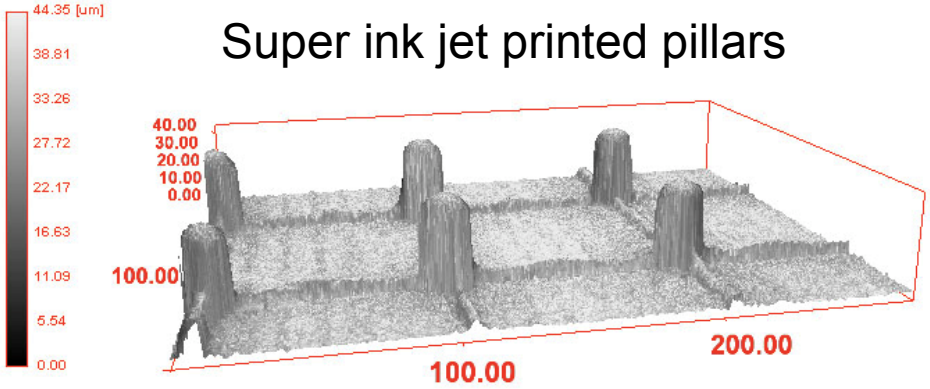
2D thin film battery

3D battery

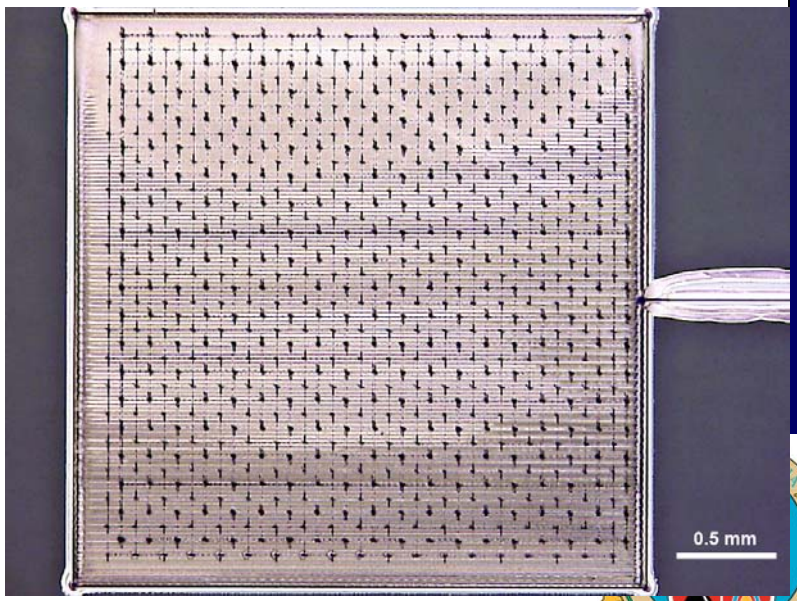


More volume and surface area

Super ink jet printed pillars



3x3 mm pad
722 pillars
40 μm height
10 μm diameter



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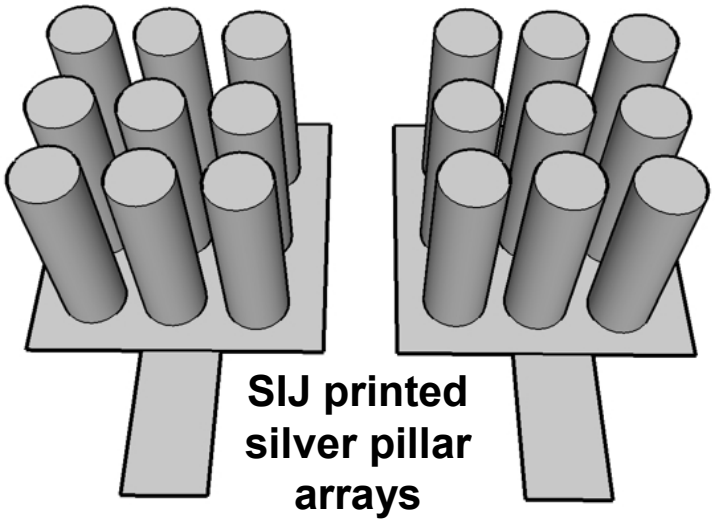
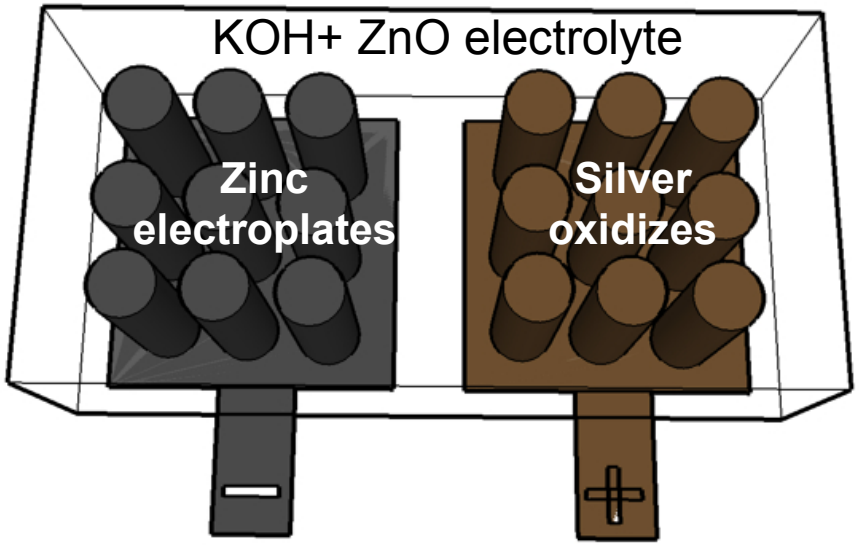
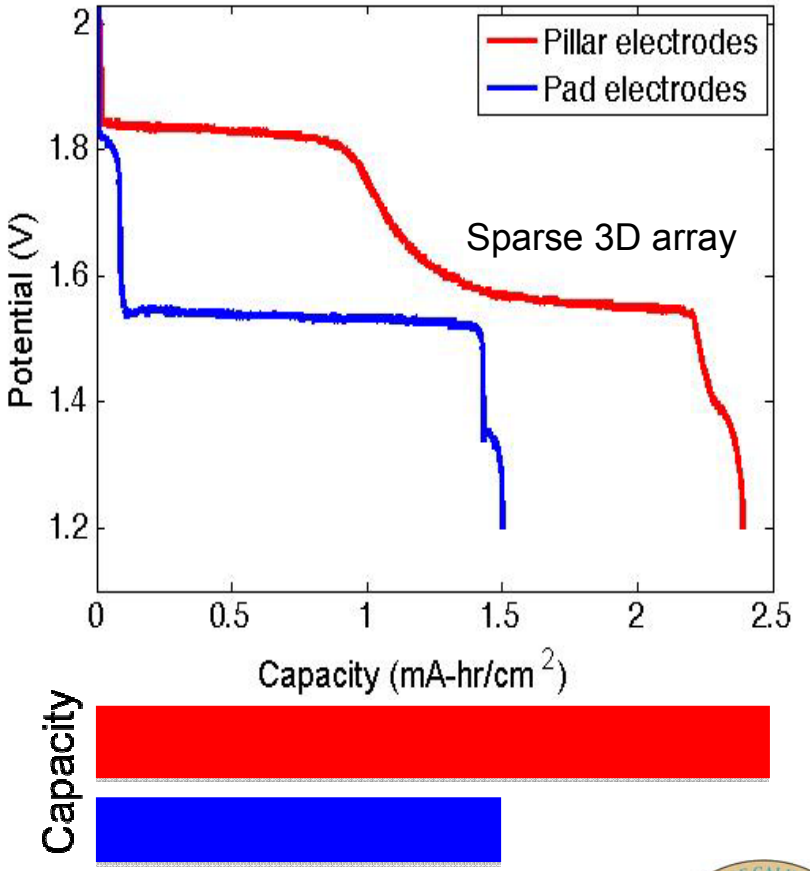
ENERGY COMMISSION

3D Zinc Silver Alkaline Microbattery







Summary

- Wireless sensor nodes need energy storage units that can provide 3.5 mAh/cm^2 (5mWh/cm^2) and current pulses >2mW.
- Printed solid state electrochemical capacitors store ~50 mF/cm^2
- 3D zinc silver microbatteries increase electrode volume and surface area for a footprint area have shown a 60% increase capacity over thin film electrodes