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Effective Nanometer Airgap of NEMS Devices using Negative Capacitance of Ferroelectric Materials

A novel method reduces the effective air gap and switching voltage in NEMS devices, enabling ultra-low power consumption for switching, memory, and display applications, including use as non-volatile memory.

Nanoelectromechanical systems (NEMS) are seen as one of the most promising candidates as switches, memory, displays, and sensors for next general extreme low power electronics. However, one of the main challenges being faced by the technology is the fabrication and operation or ultra-scaled NEMS for high density integrated circuits. It is extremely challenging to produce NEMS with an air gap below a few nanometers due to issues such as surface roughness, different non-ideal forces, and tunneling.

Purdue University researchers have developed a method to reduce the effective air gap without physically altering the NEMS device. The system can also operate as an effective ferroelectric memory with greatly reduced switching voltages. All these characteristics will lead to a dramatic saving in power for NEMS switching, memory, passive display, and other applications.

Advantages:

-Greatly reduces air gap and switching voltage

-Can be used as a non-volatile memory

-Dramatically reduces power consumption

Potential Applications:

-E-reading devices

-Cell phones

-Computers

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