

'Soft' Amplifier Circuits Based on Field-Effect Ionic Transistors

Niels Boon and Monica Olvera de la Cruz

'Soft' electronics is paving the way towards devices with extraordinary properties, such as self-assembly, stretchability, or integration with living tissues. Here, we designed a theoretical model based on semiconductor field-effect transistors and neurons that incorporates readily-available soft materials. FEiT was confirmed to show sub-threshold, active and ohmic operational modes using numerical simulations of elementary amplifier circuits. Numerical simulations and theory show that Field Effect Ionic Transistors (FEiT), in which ion currents are gated inside soft materials, can be used as voltage amplifiers or to build logical circuits.

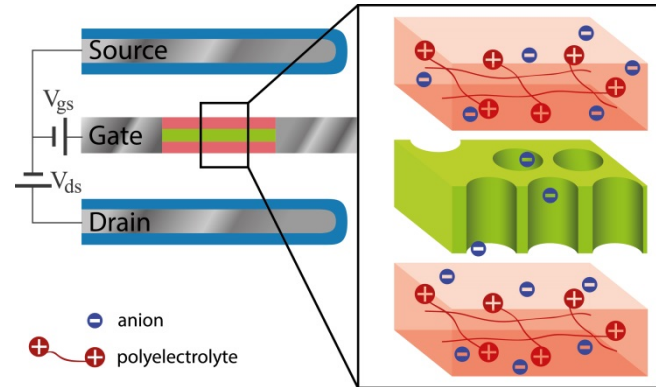


Figure: The model system that is considered, showing the porous gate material in green which is sandwiched by layers of cationic polymer electrolyte, corresponding to the red regions. Electric currents convert to ion currents at the (redox-) source and drain electrodes. External voltages V_{gs} and V_{ds} and determine the response of the device, similar to semiconductor FETs.

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