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**'Soft' amplifier circuits based on field-effect ionic transistors**
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Soft materials can be used as building blocks of electronic devices with extraordinary properties. We demonstrate that an ionic analogue of the semiconductor field-effect transistor (FET) could be used for voltage and current amplifiers. Our theoretical model incorporates readily-available soft materials, such as conductive porous membranes and polymer electrolytes to represent a current-gating device that can be integrated in electronic circuits. By means of Nernst-Planck numerical simulations as well as an analytical approach towards expressions that describe steady-state currents, we find that the behavior in response to various input voltages can be categorized into ohmic, sub-threshold, and active modes. This is fully analogous to what is known for semiconductor FETs. Pivotal FET properties such as threshold voltage and transconductance must be related to half-cell redox potentials as well as polyelectrolyte and gate material properties. We further extend the analogy with semiconductor FETs through numerical simulations of elementary amplifier circuits in which we successfully substitute the semiconductor transistor by an ionic FET.

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