converting energies. The electron's thermal current removes heat from the hot reservoir via $\left(J_{el}^{R}\right)_{\Delta V}$ and rejects waste heat into the cold reservoir via $\left(J_{el}^{L}\right)_{\Delta V}$. No energy conversion is possible when the Seebeck coefficients is vanishing.

We also consider the nanojunction in a three-terminal geometry, where the current, voltage, and electric power can be modulated by the gate voltages, which shift the states of the junction. We observe that the gate field can control the magnitude, power on-off, and polarity of the induced current and voltages generated by the Seebeck effect. Such current-voltage characteristics could be useful in the design of nanoscale electronic devices such as a transistor or switch. Notably, the nanojunction as a transistor with a fixed finite temperature difference between electrodes can power itself using the Seebeck effect. The results of this study may be of interest to researchers attempting to develop new forms of thermoelectric nanodevices.

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