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Thermoelectric and Themorectification properties of quantum dot junctions[1] DAVID M.-T. KUO, Department of Electrical Engineering, National Central University, YIA-CHUNG CHANG, Research Center for Applied Sciences, Academia — The electrical conductance, thermal conductance, thermal power and figure of merit (ZT) of semiconductor quantum dots (QDs) embedded in an insulator matrix connected with metallic electrodes are theoretically investigated in the Coulomb blockade regime. The multilevel Anderson model is used to simulate the multiple QDs junction system. The charge and heat currents in the sequence tunneling process are calculated by the Keldysh Green function technique. In the linear response regime the ZT values are still very impressive in the small tunneling rates case, although the effect of electron Coulomb interaction on ZT is significant. Considering the inelastic scattering effect arising from size fluctuations, defects and electron-phonon interactions, the reduction of ZT values is serious. In the nonlinear response regime, the nonlinear heat flow with respect to temperature is observed. When the coupling between the QDs and the electrodes is asymmetrical, we observed a thermal rectification behavior, which is also influenced by the electron Coulomb interactions and energy level differences between the two dots.

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