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Nonequilibrium thermal entanglement[1] LUIS QUIROGA, FERNEY RODRIGUEZ, Universidad de los Andes, MARIA RAMIREZ, ROBERTO PARIS, Universidad Javeriana — For quantum systems in contact with heat reservoirs at an unique and fixed temperature the equilibrium thermal entanglement has been extensively studied. However, the entanglement of nonequilibrium quantum systems has been scarcely considered. New possibilities for entanglement production and manipulation in nonequilibrium situations, where quantum coherences are dominant, are emerging. The aim of the present work is to correlate thermodynamical nonequilibrium steady-state features with entanglement properties of quantum nanosystems. We show an intimate relationship between stationary heat current, entropy production rate and entanglement for a simple quantum system coupled to two heat baths at different temperatures. We show that while the quantum informational entropy remains constant in a steady-state situation, the rate of production of thermodynamic entropy is linearly proportional to the nonequilibrium concurrence. We find an enhanced-suppressed entanglement transition which takes place when a temperature gradient is applied. Additionally, a temperature gradient allows for producing quantum states with exactly the same amount of entanglement as for an equilibrium situation but with different entropies and heat currents.

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