Minimum entropy production rate for macroscopic systems

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The entropy production rate is decomposed into two contributions, the excess entropy production rate and the housekeeping entropy production rate. The excess entropy production rate, which is introduced by the 2-Wasserstein distance in the optimal transport theory for the Fokker-Planck equation or the master equation, is regarded as the minimum entropy production rate for a given state transition [1-4]. Based on a geometric structure in the optimal transport theory, we can discuss thermodynamic trade-off relations, such as thermodynamic uncertainty relations or speed limits for the excess entropy production rate. In this talk, we introduce the concept of the excess entropy production rate based on the optimal transport theory and discuss generalizations of the excess entropy production rate for two macroscopic systems, the reaction diffusion systems [5] and hydrodynamic systems [6]. We discuss thermodynamic trade-off relations for pattern formation and Couette flow.

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