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Entropy in Non-equilibrium Systems

Linton C. Fernandies

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Abstract

The second law of thermodynamics states that "the entropy of an isolated system cannot decrease with time". Entropy is defined for equilibrium states. An infinitesimal change in Clausius entropy for a reversible process is given as $dS = \frac{dQ_R}{T}$. However, there is no general definition for entropy in non-equilibrium states so far. The definition of entropy has not been generalized, and hence the second law of thermodynamics to non-equilibrium states. In this report, we use an axiomatic approach to evaluate the upper and lower bounds on the non-equilibrium states. By using the local equilibrium hypothesis, we evaluate non-equilibrium entropy for an isochoric process.

Keywords: Entropy, Non-equilibrium thermodynamics, Axiomatic approach.