

MATHEMATICS OF THE 2ND LAW OF THERMODYNAMICS

MD. Shafiqul Islam

Bangladesh University of Engineering and Technology, Dhaka-1000, Bangladesh

ABSTRACT

In this paper, I have shown the 2nd law of thermodynamics as a consequence of the 1st law of thermodynamics. It is not claimed that the 2nd law of thermodynamics is a redundant of the 1st law, rather I shown here how we can extract the 2nd law from the mathematical formulation of the 1st law of thermodynamics. The Clausius statement of the 2nd law of thermodynamics is, it is impossible to construct a device whose sole effect is the transfer of heat from a cool reservoir to a hot reservoir. An alternative statement of the law is, “All spontaneous processes are irreversible” or, “the entropy of an isolated system always increases”. Having strong experimental evidences, this empirical law is obvious, which tells us the arrow of time and the direction of spontaneous changes. I proved the statement in this paper using the mathematical formulation of the 1st law of thermodynamics.

Keywords: thermodynamics, first law, second law, mathematical formulation