On the Minimum Free Energy for a Rigid Heat Conductor with Memory Effects

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Abstract: A general closed expression for the minimum free energy, related to a state of a rigid heat conductor with memory, is derived in terms of Fourier-transformed functions, by using the coincidence of this quantity with the maximum recoverable work obtainable from that state. The linearized constitutive equations both for the internal energy and for the heat flux consider the effects of the actual values of the temperature and of its gradient, together with the ones of the integrated histories of such quantities, which are chosen to characterize the states of the material. An equivalent formulation for the minimum free energy is given and also used to derive explicit formulae for a discrete spectrum model.