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Advanced Materials Science Research

Optimization problems in non - equilibrium thermodynamics: Methods and results

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Biography

Ivan Sukin has expertise in process control and optimization. His fi eld of interest is the thermodynamics, control and optimization of separation processes. He works within the Anatoly Tsirlin's school of fi nite-time thermodynamics that has its roots within the fi rst works in this fi eld. The passion of sukin is the distillation optimal control.

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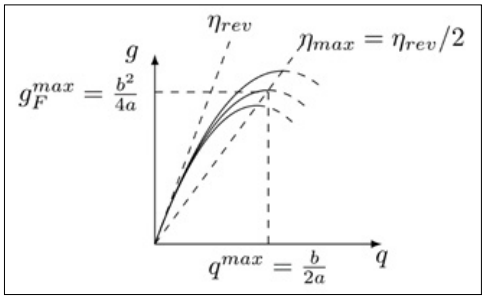
Thermodynamics estimates for ultimate capacity of various systems exist for a long time. Such estimates include Carnot effi ciency and Gibbs minimum work of separation. These classical estimates do not take irreversibility into account. Sources of the irreversibility are heat and mass transfer phenomena. For some processes, such as the heat transfer, classical estimates simple do not make any sense, since the process is suffi ciently irreversible. These problems lead to the creation of the fi nite-time thermodynamics, which divides the system into union internally reversible subsystems. The interaction of these subsystems is irreversible and leads to the entropy generation. One could solve optimization problems within this framework. The general approach is following: 1. Write the balance equations. These are mass, energy and entropy balances. The entropy balance equation contains the entropy generation. 2. Minimize the entropy generation for given system structure and fl uxes. 3.Construct the feasible set of the system, substituting the minimum entropy generation into balance equations. The talk summarizes solutions of the above-mentioned problems for systems of heat and mass transfer, chemical reactions, separation processes, heating and cooling engines.



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