

熱エネルギー有効活用における熱力学第2法則と伝熱学の重要性

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Importance of the Second Law of Thermodynamics and Heat Transfer in Effective Utilization of Thermal Energy (*Laboratory for Zero-Carbon Energy, Tokyo Institute of Technology*)

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Although thermal energy is ubiquitous, its understanding is elusive. To make proper advances in R&D of thermal energy utilizations, it is important to understand (i) thermodynamics regarding the quality of thermal energy, especially the relation between exergy, entropy, and dissipation, and (ii) heat transfer discipline that is indispensable for descriptions of the rate of heat flow and the temperature field. In this lecture, these issues are explained exemplifying, e.g., the forced-flow thermoelectrochemical conversion¹⁻³⁾ and a thermoelectrochemical cell⁴⁾ that have been studied by the lecturer, and a direct air capture (DAC) of CO₂ that has recently drawn attention.

Keywords : Thermodynamics; Heat Transfer; Thermoelectrics

熱エネルギーは普遍的だが分かりにくい側面をもつ。熱エネルギー有効活用の研究開発を適切に推進するには、熱エネルギーの質を表現するエクセルギー、エントロピー、散逸の相互関係などに関する熱力学、および、熱輸送レートと温度場の描写に不可欠な伝熱学への理解が重要となる。これらの事項を、講演者が研究してきたフロー熱発電¹⁻³⁾、熱化学電池⁴⁾や、最近注目を集めるCO₂の直接空気回収(Direct Air Capture, DAC)などを題材にしつつ説明する。

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