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Rethinking Thermoelectric Effects In Seebeck And Peltier Elements: Toward A Unifying Paradigm

Michael Spry

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This book emerged from work on an introductory text about thermoelectric (TE) technology--one that would review theory from the perspective of zero-sum energy balance right down to segments within TE elements. This would involve the resolution of temperature dependencies using finite element analysis, and the result would depend upon the maximum level of mathematical harmony among the effects. Energy balance would have to be demonstrated *everywhere* along the length of each semiconductor element. This work demanded a far greater degree of theoretical scrutiny than the common 'system-level' assessments which treat each element like a 'black box'.

Then came a surprising and very significant discovery--soon followed by additional findings which challenged fundamental concepts of thermoelectric theory. The pioneering TE work of William Thomson was ultimately drawn into question with strong indications that he had employed invalid assumptions and that many of his central ideas could not hold up against the demands of sub-element analysis.

In this thoroughly-illustrated and very comprehensive book, this 26-year veteran of the thermoelectric field explores his research and reveals new hypotheses which are in conformance with the balance of energy throughout individual TE elements--whether the technology is power generation or cooling. Using new-concept visual aids, he examines the codependency of temperature gradients and bulk properties, showing how they all interact within these technologies--and reviews the energy levels that would result with TE material in Thomson's classical experiments. Containing over 170 graphs and other illustrations plus highly-detailed descriptions of the algorithms employed in the computer models, *Rethinking Thermoelectric Effects In Seebeck And Peltier Elements: Toward A Unifying Paradigm* presents a truly integrated picture of thermoelectric property interactions. It can not only serve as a more substantial foundation for future theory, but provides illumination to enhance our understanding today.

This title is not available in a Kindle version due to the special challenges of presenting equations in that format. At such time as the capability of the protocols makes it more feasible to display such content in a consistent manner, a Kindle version will be offered.

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