



# Nanostructured Energy Devices: Equilibrium Concepts and Kinetics

*Juan Bisquert*

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Due to the pressing needs of society, low cost materials for energy devices have experienced an outstanding development in recent times. In this highly multidisciplinary area, chemistry, material science, physics, and electrochemistry meet to develop new materials and devices that perform required energy conversion and storage processes with high efficiency, adequate capabilities for required applications, and low production cost. **Nanostructured Energy Devices: Equilibrium Concepts and Kinetics** introduces the main physicochemical principles that govern the operation of energy devices. It includes coverage of the physical principles that control energy devices made of nanostructured and bulk materials, with the main attention focused on solution processed thin film technologies.

The book analyzes the fundamental concepts, main properties, and key applications of energy devices that are made using nanostructured materials and innovative thin film low cost technologies. This includes hybrid and organic solar cells, electrochemical batteries, diodes, LEDs and OLEDs, transistors, and the direct conversion of solar radiation to chemical fuels. It decodes rigorous formulation of thermodynamic concepts to establish energy diagrams, and explains also the fundamental kinetic models that determine the flow of electrons and ions in the device. The author lays out the main properties of semiconductors and their junctions for applications in solar cell and solar fuel devices. He emphasizes a unified view of the device operation principles that covers well-known examples but also enables you to discuss original research topics on a solid ground.

Although a challenging field of science and technology, energy devices such as solar cells and batteries have the potential to impact the creation of a carbon-free energy economy. However, the field draws scientists from a broad set of backgrounds, united towards common goals. This text presents the main concepts that apply to several types of devices, from a very basic level so that you can gain insight into the general view of principles of operation of the energy devices. It pulls together the views and terminologies used by several communities to create better communication and increased collaboration among them.

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