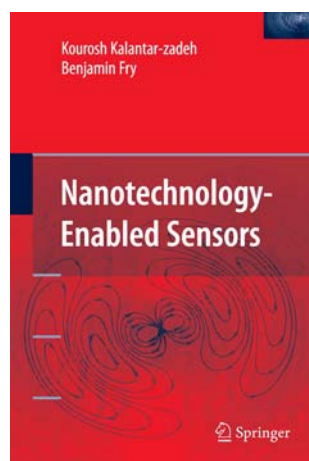


## Kouros Kalantar-zadeh and Benjamin Fry: Nanotechnology-enabled sensors

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**Bibliography**  
Nanotechnology-enabled sensors  
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**The book's topic** Nanoscience enables the synthesis of materials with tailor-made properties that may differ substantially from the respective bulk properties. Among other uses, the design of chemical sensors is one of their fundamental applications which makes use of either selective interactions of nanostructured layers or their improved transducing properties. Kalantar-Zadeh and Fry give a comprehensive overview of such sensor systems and the underlying aspects of modern nanoscience.

**Contents** The book has an outstandingly broad scope, as the authors have not restricted themselves to just summarizing sensing approaches. Instead, they aim at the big picture of nanomaterials and the resulting sensors. Consequently, the first five chapters contain the physical and chemical background, whereas chapters six and seven introduce a timely selection of different sensing applications.

After a brief introduction to the concepts of chemical sensing and nanotechnology, the authors discuss the fundamentals of measurement science and transducers including analytical properties, for example accuracy, detection limit, reproducibility, etc., and sensor response functions. Following this, they introduce a wide range of physical effects utilized in transducers, including, e.g., photoelectricity, chemoluminescence, thermoresistance, and the piezoelectric effect. Based on this, Chapter 3 then describes the major and most widespread transducers covering, among others, optical, electrochemical, solid-state, and acoustic wave transducers, for example fibre optics, ISE, diodes, MOS devices, FET, and mass-sensitive devices. Chapter 4 is devoted to a wide variety of nanofabrication and patterning techniques, for example synthesis of nanoparticles, thin-film deposition (PVD, CVD, liquid phase techniques, nanolithography,...). Finally, characterization techniques for nanomaterials, including spectroscopy and microscopy, conclude the more fundamental, first, part of the book.

Following this are two chapters describing the actual sensors. One is entirely devoted to sensors based on inorganic nanostructures. After a short introduction to the theory of the solid state, it covers a variety of gas-sensing applications, phonons, and mechanical and optical sensors and concludes by briefly discussing magnetic devices. The other chapter discusses the wide field of organic nano-

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materials in sensing including the underlying physical (e.g. adsorption, self-assembly, surface modification) and chemical (e.g. molecular imprinting, dendritic polymers, immunostrategies, protein and DNA-based sensors) concepts.

**Comparison with existing literature** “Nanotechnology-Enabled Sensors” is a textbook giving the reader an introduction to both sensing and nanotechnology, which distinguishes it from other excellent textbooks, for example “Chemical Sensors” by Peter Gründler or a growing number of introductions to nanotechnology (e.g. by Köhler and Fritzsche or Schmid to name but two). It extensively deals with the chemical and physical fundamentals of sensing and always keeps the sensor application of a material in mind. The focus on nanomaterials naturally leaves out popular commercially available systems (e.g. Figaro sensor, Lambda probe), which is by no means a shortcoming!

**Critical assessment** Kalantar-zadeh and Fry have succeeded in covering an outstandingly wide range of topics in a very pleasantly readable textbook of some 450 pages.

Despite its multifaceted scope it stays very clear and concise. Its truly encyclopaedic span, of course, makes it necessary to discuss only briefly the topics underlying both nanoscience and sensor effects, leaving out in-depth discussion. However, this focus on broadness of topics without confusing the reader with too many details, and the extensive reference lists at the end of all chapters, make it a highly appreciable introduction to the field of nanotechnology-enabled sensing.

**Readership recommendation** This book is an excellent tool both for graduate students (after Bachelor level) and scientists wishing to obtain a good, concise overview of both nanotechnology and sensing to rapidly acquire the big picture of this dynamically evolving field.

**Summary** “Nanotechnology-Enabled Sensors” briefly introduces the main chemical and physical fundamentals, characterization techniques, and applications of nanotechnology with a focus on chemical sensors. Its readability and broad scope make it excellently suited to acquiring the big picture of these topics.

**Nanotechnology-Enabled Sensors**

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