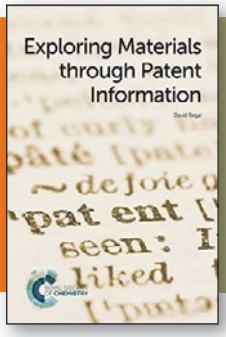


Exploring Materials through Patent Information

David Segal

Royal Society of Chemistry, 2014
266 pages, $38.90
ISBN 978-1-78262-112-6

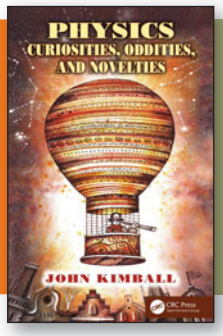
This book does exactly as its title proposes and describes several classes of materials in terms of patents that have been awarded toward their practical application. Following a good introduction about patents in general, how to file one, and how to research them, Segal provides a credible patent history for a range of materials: light-emitting diodes (LEDs), including quantum dots, organic LEDs, and liquid-crystal displays, three-dimensional printing, health care, block copolymers, aerogels, ionic liquids, flame retardants, graphene, hydrogels, and superhydrophobic materials. The chapters first describe the fundamentals of each technology, and then describe how specific patents improved upon the technology.

I found it very unusual to read a "patent history" of a material instead of learning its history from academic literature. For instance, Segal devotes four chapters to LED technology. His approach is to give a brief technological background to LEDs, referencing a few papers in the literature, and then to give the historical case for the patents toward LED commercialization. To Segal's credit, his approach was almost the same as Dr. Hiroshi Amano's, one of the 2014 Nobel laureates for blue LEDs, but more technology driven.

The book left me wondering how Segal identified which patents were critical to a material's development. While writing a material's history from published literature, it is relatively easy to link key papers through their numbers of citations, but such lists do not seem to exist for the materials described in the book. Did he somehow know that these patents were licensed? While his motivation to write the book is to encourage researchers to delve into the patent literature to assist their research, it is not clear how one goes into a search engine and finds out which technology patents are key, as Segal was able to do.

Despite my confusion about how the key patents were selected from patent databases, this book certainly fills a gap in the literature about how patents play a crucial role in a material's history and development, and would be useful to anyone researching or seeking to file a patent in the topical areas covered in the book. It would also be invaluable to any materials scientist who is interested in patent law or students interested in becoming patent lawyers, because it shows, to some degree, how materials development goes hand in hand with patents. The introduction is also valuable to the general reader because it describes the patent process and how to search the patent literature. The book could be used as a patent history for the specific materials covered, but not as a blueprint for how one would fin d or develop a patent history for other materials.

Reviewer: Karen Swider Lyons *researches fuel-cell and battery materials and their integration into naval systems in Alexandria, Va., USA.*



Physics, Curiosities, Oddities, and Novelties

John Kimball

CRC Press, 2015
380 pages, $34.95
ISBN 978-1-4665-7635-3

Galileo Galilei (1564–1641) stated, "The book (of nature) is written in mathematical language." John Kimball has tried the impossible: Summarizing the whole of physics in 380 pages and 207 figures almost without using the "language of nature," mathematics. The topics range from Newton's laws of movement to Einstein's theory of relativity, to Maxwell's electrodynamics, to Planck's quantum physics, leading to tunneling phenomena and dark energy. Is this possible? My answer is yes and no. The author explains everything in plain, well-understandable words. However, all physicists know that quantum mechanics and relativity cannot be described using words alone—many of these facts are immediately clear using appropriate mathematics. However, Kimball is not the first one to fall into this trap; he has famous predecessors (e.g., Einstein's popular explanation of simultaneity in his special relativity is also unclear). Knowing these problems, I have to say that this author did a great job. I cannot imagine a better explanation of the whole of physics in plain text. Certainly, other physicists may have problems with the way he introduces physical laws (e.g., he introduces the concept of entropy according to Shannon from the side of information theory). Personally, in an elementary introduction, I would prefer the "older" Boltzmann approach. Without mathematics, the descriptions of these connections are nearly impossible, but Kimball selected a great compromise. The sections on the latest developments in physics are very short, but clear and full of information. In this context, the description of particle physics using Feynman diagrams and quantum electrodynamics

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is—taking the impossibility of this task into account—exemplary.

The book closes with comments about Nobel laureates in physics: their lives and their ideas. It is interesting to read something about these important scientists, their family backgrounds, and philosophical ideas. These are important aspects, generally neglected, but of great importance to understand their approach to science and ideas.

This book is recommended for everyone interested in physics, especially new developments. Materials scientists will be interested in descriptions of the physical principles of alloys, magnetic materials, semiconductors, and devices and materials using these phenomena.

***Reviewer: Dieter Vollath** is CEO of NanoConsulting, Stutensee, Germany.*

Material Alchemy
Jenny Lee
BIS Publishers, 2015
152 pages, $26.81
ISBN 978-9063693763

Alchemy has been a fascinating topic for professional and lay scientists for a long time. Some famous scientists have pursued it secretly even as chemistry was taking over in the 17th century. It is not the aim of this book to go back to those times but to draw attention to the fact that materials are now being made and used in ways that were once thought impossible.

If you have an interest in art, this book will tell you how new materials are created, and if you are a materials scientist, it will walk you through the studios of some creative designers (the author, Jenny Lee, is at Studio Aikieu). There is a free app associated with the book that you should download before beginning. This will allow access to additional "hidden" content. The app recognizes images and plays animations. Also, there is a camera icon to take photographs, allowing the reader to have an interactive experience with the designer.

The book has six sections. The first called "The Vision" forecasts that synthetic biology, three-dimensional printing, and nanotechnology will change our concept of materials. It summarizes eight design projects where materials are used not only in a utilitarian way, but also to engage all senses and address moods and tactility. Examples come from garments, dyes, and the fashion industry; bioplastic from glucose found in crabs; and ceramic glazes from dust. The second chapter, "Low-Tech," shows how revisiting simple technologies can stimulate creativity. The next chapter, "Gastronomy," discusses the use of kitchen ingredients to fashion unusual materials. The fourth chapter, "The Laboratory," takes a do-it-yourself approach to creating materials such as pigments and sculptures using exothermic reactions. The next chapter, "High-Tech," is devoted to interactive design using shape-memory alloys and sensors. The book ends with a chapter on "The Alchemists," which covers energy harvesting, dyes from soils, chitin polymer from the shield of beetles, bio-filters from microorganisms such as extremophiles, and emerging biotechnologies.

The book is different from what most readers of *MRS Bulletin* read professionally. It is a combination of a coffee table book and a workbook. In a book of 152 pages, there are 48 color photos (most of them full page), 12 pages of technical data, and 11 workshops to facilitate material exploration. The book lists 32 websites of suppliers, 35 materials organizations, and 29 books for further reading. There are 27 references of which seven are books; the rest are websites—no journal articles. There is not a single equation. No topic is discussed in depth, and the terminology is often unfamiliar to a materials scientist. However, the book introduces artists and designers to new materials, and shows materials scientists what is expected of them and how one must try to be a materials scientist and designer simultaneously.

***Reviewer: N. Balasubramanian** is an independent research scholar working in Bangalore, India.*

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