

Luminescence: The Never-Ending Story

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Luminescence has fascinated human beings since times immemorial, thanks to a variety of natural phenomena such as aurora borealis, lightening, or luminous animals of various sorts. A landmark in the history of luminescent materials was the discovery of the so-called Bolognian stone in 1603. Vincenzo Casciarolo, a cobbler and amateur alchemist, while trying to convert poor materials into gold, calcined a stone containing barium sulphate with coal and obtained luminescent barium sulfide. It was the first reported example of a phosphor, because the “magic” stone released light in the dark after exposure to sunshine. Probably, Mr. Casciarolo did not suspect that, after some centuries, this class of materials would become more important than gold itself in the daily life of people.

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Virtually all of the electromagnetic spectrum is used to investigate the structure and properties of chemical systems, all the way from the γ -rays (radiation chemistry) to radio frequencies (NMR). The tiny window of Visible light offers invaluable information regarding molecular electronic excited states, also providing snapshots of dynamic processes down to the femtosecond time scale. Moreover, visible light has a huge relevance for several technological applications that pervade our daily life. The very reason for this fact is extremely simple: the human eye is a prodigious sensor for these specific photons. Accordingly, if we want something to be immediately perceived by people, it has to emit light in the wavelength range between 380 and 700 nm and possibly all across this interval, because humans have evolved under the sun and have a strong preference for white light.

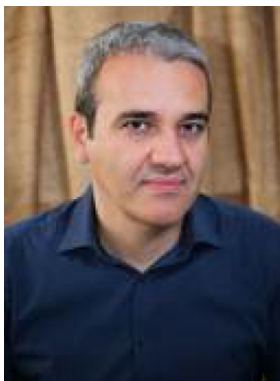
Emission of visible radiation from matter can be prompted by several stimuli, as different as heat and acoustic waves. However, light and electricity—affording photoluminescence and electroluminescence, respectively—are by far the most utilized, and this volume is specifically dedicated to these two phenomena.

In the last 20 years, the interest towards photoluminescence and electroluminescence has increased substantially, also as a consequence of the growing demand for efficient and sustainable solutions in the areas of analytical chemistry, lighting, and displays. However, surprisingly, the number of volumes dedicated to these topics is limited and somewhat outdated. We therefore accepted with enthusiasm the invitation to edit a topical collection for Topic in Current Chemistry as a nice opportunity to fill this gap and assemble an up-to-date resource in the field.

This collection encompasses the discussion of the most established luminescent materials, such as organic polymers, transition metal complexes (iridium, copper, platinum, gold) and inorganic phosphors, with special emphasis on their use in emitting devices. Also contributions primarily focusing on electroluminescent devices—organic light-emitting diodes (OLEDs) and light-emitting electrochemical cells (LECs)—and fundamental photophysical phenomena of technological interest—photochemical upconversion and thermally activated delayed fluorescence (TADF)—are discussed. Finally, luminescent perovskites and near-infrared emitters are illustrated as examples of materials with still limited or no technological applications, but with wide potential for development.

We warmly thank the colleagues across Europe, Asia, and North America for the overwhelmingly positive response to our invitation and for the time and passion invested by them and their coworkers in writing these papers. We are confident that they contributed to a collection that will be an important reference text on institutional and personal libraries for several years to come within the wide scientific community working on luminescence.

Finally, we wish to thank the reviewers, who carefully and without compensation checked the different chapters, ensuring that all the contributions are truly state-of-the-art overviews of the respective topics and the Springer editorial staff for having effectively assisted us throughout the entire editing process.



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