Editorial

Margherita Venturi¹ · Mila D'Angelantonio²

Published online: 9 January 2017

© Springer International Publishing Switzerland 2017

The chemical effects of high-energy radiations, such as those emitted by radioactive substances, generated by high-energy machines and nuclear reactors, concern a branch of chemistry called radiation chemistry. This term was proposed by Milton Burton in 1942 for the needs of the Manhattan Project, the secret atomic energy research program carried out in the United States during the Second World War. It is interesting to notice, however, that the first radiation-chemical change was observed as early as 1895 by Röntgen when he established the existence of a penetrating, invisible radiation—X-rays—able to fog a photographic plate. Indeed, as Burton wrote (C&EN, 1969, Feb. 10, 86): In May 1942, the title radiation chemistry did not exist ... I sought an appropriate name for an area that we quickly realized has existed for 47 years without any name at all. The name radiation chemistry came out of the hopper; I didn't like it; I asked Robert Mulliken advice. He couldn't think of anything better and, with that negative endorsement, the old field received its present name.

Since that time, radiation chemistry has developed at an incredible rate. For at least 30 years the interest focused on basic research, exploiting steady-state and time-resolved techniques, in the field not only of chemistry, but also physics and biology. These studies, reported in a large number of papers and books, endeavored to understand the mechanisms of a wide variety of radiolytically induced reactions, and to collect kinetic data and absorption spectra of the unstable species formed by the interaction of high-energy radiations with very different systems, as far as chemical

This article is part of the Topical Collection “Applications of Radiation Chemistry”; edited by Margherita Venturi, Mila D'Angelantonio.

✉ Margherita Venturi
margherita.venturi@unibo.it

¹ University of Bologna, Bologna, Italy

² ISOF-CNR, Bologna, Italy

composition and aggregation state are concerned. These radiations were soon found to induce useful chemical changes in various substrates resulting in their use for diverse applications. The first applications were in medicine for diagnostic and therapeutic purposes, but a variety of interesting industrial applications rapidly emerged, such as sterilization of different materials and polymer preparation, modification, and degradation. The applicative aspect of radiation chemistry strongly expanded, taking advantage of the great amount of results provided by basic studies, so that today high-energy radiations are employed with various aims in several other fields like environment, biotechnology, cultural heritage, and food treatment.

These spectacular advances are illustrated in the present topical collection of *Topics in Current Chemistry* that showcases contributions from the most prominent expert groups. It indeed reports the outstanding developments in the industrial, biotechnological, and environmental fields including several recent and interesting topics. These are (a) radiation-induced degradation of organic pollutants in waters and wastewaters, (b) advantages of radiation technology for upgrading and refining high-viscous oils and petroleum products, (c) use of gamma radiations for treating cultural heritage, (d) application of radiation chemistry to solve some technological issues related to nuclear energy, (e) radiation-induced grafting for the functionalization and development of smart polymeric materials, (f) radiation engineering of multifunctional nanogels, (g) chitosan-based matrices prepared by gamma irradiation for tissue regeneration, (h) electron beam technology for environmental pollution control, (i) radiation technology applications in the food industry, and (j) application of radiation sources and accelerators in the field of space research and industry.

We believe that this topical collection represents a good opportunity not only to highlight the research activities carried out by exploiting the peculiar features of the high-energy radiation with non-experts, but also to stimulate the interest of a wide range of readers for this relatively new field. Finally, we would like to express our gratitude to the colleagues who committed to deliver high-quality contributions, and to the editorial staff at Springer for their support throughout the development of this topical collection.

Margherita Venturi

Mila D'Angelantonio