Preface

Observations of the interstellar space by radioastronomers suggested the existence of chains of carbon atoms in some particular stars, the red giant ones. With the aim of mimicking the conditions existing in these stars to produce such carbon chains in a laboratory, Sir Harold W. Kroto, Robert F. Curl and the late Richard E. Smalley were certainly not suspected that they were on the way of a discovery, which would be awarded by the Nobel price in Chemistry a few years later. The analysis of the carbon clusters produced by directing an intense pulse of laser light at a carbon surface revealed the existence of caged molecules exclusively constituted by carbon atoms: the *fullerenes*. After graphite and diamond, it was a new form of carbon that was thus discovered. Whereas the two former ones are infinite-atom arrays, fullerenes are well defined molecules.

Following the first evidence for fullerenes in 1985, other important breakthroughs in fullerene science occurred. It was Roger Taylor's expertise in chromatography that enabled him to obtain the first pure samples of C_{60} and C_{70}, and hence to make a decisive contribution to the Sussex group's "one-line proof" of the structure of C_{60} in the now-classic 1990 paper on "*Isolation, Separation, and Characterisation of the Fullerenes C_{60} and C_{70}: The Third Form of Carbon*" (R. Taylor, J.P. Hare, A.K. Abdul-Sada, H.W. Kroto, *J. Chem. Soc., Chem. Commun.*, 1990, 1423). With the availability of initially tiny amounts of the two fullerenes, it was possible to begin the exploration of the chemistry, spectroscopy and properties of the fullerenes that has been such a major theme in chemistry in the last 15 years. The development of the macroscopic scale fullerenes synthesis by Wolfgang Krätschmer and Donald Huffman was certainly the decisive step allowing intensive research in this new branch of chemistry, with consequences in such diverse areas as superconductivity, biology and materials science. Finally, Sumio Iijima made another major development in 1991 with the discovery of carbon nanotubes, the missing link between graphite and *fullerenes*, as well as a perfectly suited material to be used in the emerging field of nanotechnology.

The purpose of this book is to summarize the basic principle of *fullerene* chemistry, but also to highlight some of the most remarkable advances that occurred in the field during the last recent years. Indeed, the rapid advances in fullerene synthetic chemistry have moved towards the creation of functional

systems with increased attention to potential applications. *Fullerene* research is now a truly interdisciplinary branch of science. *Fullerene*-based derivatives have shown a wide range of physical and chemical properties that make them attractive for the preparation of supramolecular assemblies, nanostructures and new advanced materials for optoelectronic devices. On the other hand, recent studies have shown that *fullerenes* exhibit interesting biological activities. All these aspects of *fullerene* science are summarized in the different chapters collected in this book. An additional chapter is devoted to a related field, namely carbon nanotube chemistry. The latter is still at an early stage; however many of its developments are directly related to the knowledge accumulated in *fullerene* chemistry over the last 20 years.

The different chapters of the present book have been prepared by prominent colleagues and we would like to warmly thank all of them for their contributions and their enthusiasm to participate to this adventure. We have a special thought for Roger Taylor, who prepared his chapter while being seriously affected by his disease. Roger is deceased on February 1, 2006. He was one of the pioneers of *fullerene* chemistry and a research collaborator and good friend of many working in our field.

Our gratitude is extended to the Royal Society of Chemistry for its support in this enterprise and to all the RSC team for the efficient handling of all the chapters. We further thank Juan Luis Delgado de la Cruz for the design of the cover picture.