ASSOCIATE EDITOR'S *message*

Femtolasers & Ultrafast Spectroscopy

It gives me immense satisfaction to be associated with this special BARC Newsletter on "Ultrafast Spectroscopy with Femtolasers". Femtosecond laser has fundamentally changed our concept of chemical reaction and made it possible to see the movement of every atom during the chemical reaction using the world's fastest camera. Such development not only helps us to understand the fundamental chemical and biological processes in real time but is also important in the development of modern tools for industrial applications. The importance of femtochemistry research is reflected in the Nobel Prize in Chemistry awarded to Prof. Ahmed H. Zewail in 1999 for his work on the transition states of chemical reactions using femtosecond spectroscopy.

This special issue provides a glimpse of the spectroscopic research initiated in Chemistry Group, BARC and the effort for indigenous development of state-of-the-art experimental facilities using high power femtolaser in accordance with the country's "Atmanirbhar Bharat" mission. I sincerely hope that this thematic issue will enrich the scientific community and inspire further development and deployment of femtolaser for the benefit of mankind.

This special issue comprises nine articles covering a wide range of research activities from time-resolved spectroscopy to analytical applications of femtolaser. The first two articles provide a historical perspective on the femtochemistry research in the Chemistry Group. The first article showcases our effort to develop a transient absorption spectrometer using a home built amplified femtolaser for the first time in India and the application of this technique in understanding the chemical processes, like solvent relaxation, proton transfer, electron transfer, H-bond rearrangement, etc. which are ubiquitous in chemistry and biology.

The next three articles cover the research area involving the use of femtosecond spectroscopy to understand the ultrafast dynamics of charge carriers in a wide range of nanomaterials, like dye-sensitized nanoparticles, quantum dots (QD), QD-molecule composite, perovskites, organic semiconductors, etc. having direct relevance to solar energy conversion and photocatalysis. The development of modern state-of-the-art spectroscopic setup is presented in the next two articles. A brief account of the design and development of a two-dimensional infrared (2DIR) spectrometer, a first of its kind in India, and its application to unravel the hidden information on the dynamic coupling between molecules with femtosecond time resolution is presented. Molecular interaction at interfaces has wide technological importance. The next article describes a unique technique based on the Vibrational Sum Frequency Generation (VSFG) and discusses its applications in environmental and biological studies at aqueous interfaces. The generation of plasma using a femtolaser and its application in the mapping of elemental composition in intricate matrices has been presented in the next article. The final article of the issue describes our recent effort for the generation of ultrashort electrons by multiphoton ionization of water using a high power femtolaser to study the reactivity of electrons at the early stage of their birth.

The sincere effort of our colleagues, past and present, in this frontier area of research, helped us to reach a new height which is reflected in more than a hundred publications in reputed high impact international journals and more than 30 PhD theses using femtolaser based spectroscopic techniques.

Finally, I would like to thank each of the contributors for their cooperation in preparing this special issue. I also thank my colleagues in Ultrafast Spectroscopy Section, RPCD, Chemistry Group, for their help and encouragement during the preparation of this special issue. I sincerely acknowledge the Newsletter editorial team of SIRD for their untiring effort in bringing out this special issue in a time-bound manner.

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