

Elementary Chemical Reactions: Not so Elementary

by

Prof. N. Sathyamurthy

Department of Chemistry, IIT Kanpur

Abstract

A variety of chemical reactions occurring in Nature are quite complex. They are understood in terms of elementary reactions. It turns out that these elementary reactions are not so elementary. This is because, the molecules have different degrees of freedom and each one of them has a role to play in influencing the rate of the reactions. Understanding the way these elementary reactions occur and the role played by different degrees of freedom has paved the way to unlocking the chemical energy present and channelising it in the form of chemical lasers. These in turn have enabled a deeper understanding of the forces operative in chemical reactions.

The intermolecular interactions can be computed by quantum mechanical methods and the dynamics of elementary chemical reactions on these potential energy surfaces can be studied by following the dynamics either using classical mechanics or using quantum mechanics. Understandably, a quantum mechanical approach is the preferred route. But the former had provided much insight.

Using examples of elementary chemical reactions involving hydrogen and helium atoms and their ions, results from the work carried out at IIT Kanpur will be presented and an insight into their dynamics will be provided.

About the speaker

Dr. N. Sathyamurthy, born in Agarasethur, a former French territory in Tamilnadu, received his BSc and MSc degrees from Annamalai University, Tamilnadu. He received his PhD degree from Oklahoma State University, Stillwater, Oklahoma, USA. After a post-doctoral stint at the University of Toronto, he joined IITK in 1978 as a lecturer. He rose to the rank of a Professor in 1985. An author/coauthor of more than 130 research papers, Dr. Sathyamurthy has edited a book on Reaction Dynamics. He received the S.S. Bhatnagar Prize in Chemical Sciences for the year 1990. He is a Fellow of the Indian Academy of Sciences, Bangalore and Indian National Science Academy, New Delhi.