

S.K. Blattachayya.



### SUDHIR KUMAR BHATTACHARYYA

(1909 - 1987)

#### Elected Fellow 1954

#### EARLY LIFE

Professor SUDHIR KUMAR BHATTACHARYYA was born on March 1, 1909 at Mulpara in the district of Dacca (now in Bangladesh). His father Shri Basanta Kumar Bhattacharyya was a zamindar. He passed the Matriculation Examination of the Calcutta University in 1926 and the Intermediate in Science Examination from the Dacca Board in 1928 securing 9th position in order of merit. At that time all the Intermediate Colleges were under the Dacca Board. He then joined the Dacca I niversity from where he passed the BSc (Honours) Examination in Chemistry in the year 1931 ranking first amongst the students securing 1st class. The University of Dacca at that time unlike most of the universities in India (with the exception of University of Madras and Andhra) offered a Three - Year Honours Course and One Year MSc. Degree. In 1932, Sudhir Kumar passed the MSc Examination in Physical Chemistry, first in the 1st Class. He was awarded the University Gold Medal. He worked in the same University as a Research Scholar under the guidance of the Late Professor Jnan Chandra Ghosh. He was awarded the Sir PC Ray Prize in 1933 and awarded the degree of Doctor of Science in Physical Chemistry in 1939 in recognition of his work in the field of Photochemistry. During the period he served in the Dacca University as an Assistant Lecturer for two years, 1937-1939.

Dr Bhattacharyya joined the Indian Institute of Science, Bangalore, in 1939, where he worked in different capacities and later as an Assistant Professor and Head of the Department of Physical and Inorganic Chemistry. He left Bangalore in 1952 and joined the newly created Department of Chemistry of the Indian Institute of Technology, Kharagpur. He organised the Department as one of the most modern and well equipped one for both undergraduate and postgraduate teaching and research. He was the Senior Professor and Head of the Department of Chemistry, IIT, Kharagpur (1952-1970) and also the Deputy Director (Academic) of the Institute (1968-70). After retirement from the IIT, Kharagpur he was Emeritus Professor of Chemistry in Banaras Hindu University, Varanasi

(1971-78). Since then be spent sometime with his sons in the UK and then a fully retired life in Salt Lake, Calcutta where he had a house built for himself.

In 1947, Professor Bhattacharyya went to Europe for advanced training in the techniques and experimentation in high pressure chemistry and also in catalysis. He worked at the Imperial College of Science and Technology, London; Chemical Research Laboratory, Teddington, UK; the Van der Waal"s Laboratory, Amstardam, Holland; High Pressure Laboratory Brussels, Belgium, and the Ultra-high Pressure Laboratory in Paris. He also visited other well-known laboratories in UK, Holland, Belgium and France.

Professor Bhattacharyya attended a number of International Scientific Conferences and Congresses, delivered lectures and presided over a number of sessions.

In September, 1956 he attended the 'First International Congress on Catalysis" held at Philadelphia, USA as a delegate of the Government of India and visited a large number of Research Centres in USA. On his way back he visited some important laboratories in the UK and Germany.

In July, 1960 he attended the 'Second International Congress on Catalysis' held in Paris, France and presided over a Section of the Congress. He visited a number of Research Laboratories in France and Switzerland.

In June 1962, he participated in the 'International Symposium on the Physics and Chemistry of High Pressure' held in London and visited a number of Research Centres in Europe.

In July, 1964 he attended the 'Third International Congress on Catalysis' held at Amsterdam, Holland and presided over a session of the Congress. He also visited a number of research centres in Holland, UK, Belgium and France.

In August 1965 he attended the 'First International Conference on Researches on High Pressures' held at La Creusot, France.

Dr Bhattacharyya attended the 'First International Conference on Thermal Analysis' at Aberdeen, Scotland. He visited a number of Research Centres and delivered some lectures.

Professor Bhattacharyya organised a 'Symposium on Contact Catalysis' under the auspices of the National Institute of Sciences of India at Calcutta in 1956 and inaugurated a Symposium on Contact Catalysis held at Allahabad in 1964 at the Annual Convention of Chemists organised by the Indian Chemical Society.

Professor Bhattacharyya was elected Acharya Jnan Chandra Ghosh Lecturer of the Indian Chemical Society and delivered the lecture in Calcutta on September 4, 1967. The topic of the lecture was "Recent Advances in Some Aspects of High Pressure Chemistry".

In his lecture he refers to the pioneering work of V Ipateiff in Russia and F Haber in Germany around 1901 and high pressure Physics by PW Bridgman in USA around 1908 and bases his talk on the work done in Indian Institute of Science, Bangalore and the Indian Institute of Technology, Kharagpur. He deals with "two aspects of high pressure chemistry, one on the catalytic syntheses of carboxylic acids and esters from carbon-monoxide in presence of nickel, cobalt and iron catalysts and other organic compounds not involving carbon monoxide and the other on the kinetics and mechanism of a few acid catalysed liquid phase hydration of unsaturated organic compounds and hydrolysis of lactones." Detailed consideration of the thermodynamics of the reactions have been highlighted. The influence of process variables on the reactions has been discussed. The useful life of the catalysts and reactivation of the spent catalysts have been stressed.

Since 1933 Professor Bhattacharyya has been actively engaged in research work in various fields of Pure & Applied Chemistry: Catalysis, High Pressure Chemistry, Photochemistry, Chemical Kinetics & Electrochemistry.

He has studied a large number of catalytic reactions of the vapour/gas phase involved oxidation, reduction, dehydration and dehydrogenation in both fixed and fluidized beds using raw materials benzene, toluene, xylene, crotonaldehyde, ethylene, picolines etc. which have their origin in coal and petroleum to produce maleic acid benzaldehyde, phthalic anhydride, ethylene oxide and nicotinic acid respectively. The catalysts which have been developed promises great industrial importance. He has made an extensive study on the catalytic production of butadiene from ethylalcohol by single stage and two stage processes in both fixed and fluidized beds.

Professor Bhattacharyya has studied the catalytic conversion of ethanol to butadine by single stage and by two stage processes. The catalysts that evolved out of this investigation has been found to be the best of all the reported ones. Moreover, the conversion has been, for the first time, studied in a fludized bed reactor and phenomenal increase in the yield of butadiene has been achieved. This piece of work has aroused tremendous interest throughout the world. Catalytic conversion of ethanol to acetone, has also been extensively studied and a very high conversion of acetone has been achieved.

High Pressure Syntheses of large number of carboxylic acids and esters starting from simple and cheap raw materials like carbon monoxide, water, alcohols, other aldehydes, etc. at pressures ranging upto 1000 atm. Some of these processes will undoubtedly find applications in petrochemical and coal chemical industries. He has made detailed study of the kinetics and suggested possible mechanism and rate equations. A theory regarding these syntheses has been suggested which is now almost universally accepted.

The extensive investigation of the synthesis of vinyl ethers, acrylates etc. from acetylence, carbon monoxide etc. has resulted in remarkable improvement in the yields of these chemicals of industrial importance.

Rate equations and mechanism of some important catalytic reactions have been suggested by studying the detailed kinetics of these processes.

Kinetic of some acid-catalysed reactions has been studied under high pressure, ranging upto 4000 atm. and their mechanism has been suggested. This is a new branch of research of high current interest.

Professor Bhattacharyya has studied the photochemical reactions using various colloidal dispersions and also uranyl salts as sensitieser and the Kinetics of photoiodination and photobromination of unsaturated organic compounds.

Electrochemical preparations of some important organic compounds using porous carbon electrodes have been developed. Accurate measurements of conductance of salts in viscous nonaqueous solvents like ethanolamines have been taken in his laboratory.

Professor Bhattacharyya has for the first time proved the importance of usefulness of Differential Thermal Analysis Techniques in the structural studies of a number of single, binary and ternary oxide catalyst systems. In most of the cases the excellent correlations between thermal characteristics of the catalysts, their surface areas and catalytic activity have been found.

From his studies on chemiadsorption of oxygen, hydrogen and methanol vapour on oxide catalyst like vanadium pentoxide, silver oxide, zinc oxide and alumina and the consequent changes in their semiconductivity he has drawn conclusions which are useful in prediction of catalytic activity. He published valuable and interesting results which are theoretical and have industrial importance.

He has along with his collaborators published more than 150 original research papers in Indian, foreign & international journals. More than 50 students earned their PhD degree under his guidence and supervision. Today the High Pressure Chemistry laboratory at IIT Kharagpur, is used by his able students.

# MEMBERSHIP AND HONOURS

He has been a Fellow of the National Institute of Science of India since 1954. He was Vice-President of the Indian Chemical Society 1968-71, President of the Chemistry Section of the Indian Science Congress 1968 at Varanasi.

Besides, he was a member of a number of committees constituted by Govt. of India, CSIR, DAE, Indian Council of Agricultural Research, UGC, various university, scientific and professional bodies in India and abroad.



Professor Bhattacharyya was a corresponding member of India for International congress on Catalysis held in Worcester, Mass., USA in 1968.

He has written a book entitled "Some Catalytic Gas reactions of Industrial Importance" with Dr JC Ghosh & MVC Sastri as co-authors.

He was married to Hemanalini, daughter of Priyanath Chakraborty, Telegraph Officer, Bombay (originally from Dacca). They had two sons who are both University Professors in UK. The elder son Susanta Kumar Bhattacharyya is Professor of Manufacturing Systems, University of Warwick, Conventery, UK. The younger Asoke Kumar Bhattacharyya is Head of the Catalyst Research Division, University of Warwick. Professor SK Bhattacharyya's interest in catalysts lives through his sons both of whom are in the area of materials science and solid state chemistry and through the group of his students (holding teaching positions) working in the High Pressure Laboratory of IIT, Kharagpur.

### As A MAN

Professor SK Bhattacharyya was a pleasant personality. He loved his students like his own children. In this aspect Mrs. Bhattacharyya's role was not less. His students had free access to his place. Mrs Bhattacharyya always acted the hostess. The younger brother of the memoir writer was a student of Professor Bhattacharyya in Bangalore. He always shared Professor Bhattacharyya's affection.

Professor Bhattacharyya did not confine himself to the ivory tower. He took active part in social activity of the Institute. He was actively associated with the Higher Secondary School, the important role of which he always appreciated.

Professor Bhattacharyya passed away on December 30, 1987 at his residence in Salt Lake, Calcutta. In his demise the country lost a beloved teacher and a scientist who dwelled in both academic and applied research.

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