Akhoury Purnendu Bhusan Sinha (1928–2021)

Dr Akhoury Purnendu Bhusan Sinha, a distinguished solid-state chemist passed away at the age of ninety-three on 4 July 2021 in USA.

Everything is made of elements, and the periodic table of elements is the basis of chemistry. However, till the beginning of 1960s the study of solid state materials had little in common with chemistry and focused only on questions as whether they would generate various physical attributes. A. P. B. Sinha, fondly known as APB to his friends and colleagues, was a key player in a revolution that built a new understanding of the way in which elements in solids sometimes trade chemical personalities that result in the adoption of diverse structures leading to distinct properties like electrical, magnetic, optical and superconductivity. This understanding opened up a whole new field, the chemistry of materials, which, in turn, paved the way for their practical applications such as magnets, thermistors, ferroelectrics, thermoelectric, phosphors and laser materials.

Sinha was an atypical scientific genius. He loved sharing his ideas with others and was particularly delighted if he could start conversations with his students, fellow scientists and people whom he had never communicated before. His ideas would often cross all disciplinary boundaries. Grounded in chemistry but widely read he encouraged colleagues to pursue research in materials science and physics and was very keen on exploring the phenomena observed deeply and thoroughly. For the same reason he was happy when opportunities arose, to step away from the laboratory to attend scientific seminars and symposia where he could share ideas and discuss with fellow scientists.

Sinha was born in Bihar, India on 28 December 1928, where he had his early schooling and graduated from Patna University, winning five gold medals. He proceeded to the UK on a British Council Fellowship to pursue his Ph.D. degree at the Imperial College of Science and Technology, University of London, under the supervision of the famous physical chemist, George Ingle Finch, who later became the second Director of National Chemical Laboratory (NCL), Pune. On his return to India, Sinha joined NCL to pursue his research in physical chemistry. Perhaps, it was Finch who influenced Sinha to join NCL and provided him full support as the Director of NCL. Finch had great confidence in the abilities of Sinha and began mentoring him to shape the future of physical chemistry research at NCL. K. Venkataraman (KV), who was appointed the Director of NCL after Finch continued the support and provided Sinha the freedom as well as necessary facilities to pursue and excel in his research activities. While this seemed outrageous in the Inorganic Chemistry Division with so many senior scientists in both age and research experience, KV was confident that only Sinha, with his effusion of new ideas, mastery of new techniques and the ability to attract students could lead the Division. Sinha was made the Head of the Division in 1960.

Sinha's career stemmed from curiosity about chemical entities called mixed valence compounds. He studied the optical properties by playing with their chemistry. This led him to make hybrids of organic and inorganic materials; one outcome being laser and photoluminescent materials that could be switched on and off with light. Based on his studies on electron lattice interactions, Sinha proposed theories for ferroelectricity and developed new ideas on the thermoelectric power and mobility in semiconductors. He diligently pursued research in the synthesis of copper manganites and a series of manganite spinels. This work, carried out in collaboration with Finch (NCL) and K. P. Sinha (NCL and later at Indian Institute of Science, Bangalore), led to practical applications such as thermistors as well as a deep theoretical understanding on the origin of the distortion of spinels from cubic to tetragonal symmetry explained based on modified Jahn–Teller distortion. Sinha's research led to a widened understanding of conduction in semiconductors. His studies on low-mobility semiconductors with respect to electron transport and crystal distortion caused by electron lattice interactions led to interesting findings like magnetic order switching and memory effects in these materials. His research contributions were pioneering, combining elegant experiments with appropriate theoretical underpinnings and firmly established NCL as one of the foremost centres of research in the chemistry and application of new materials.

Within a short time after joining NCL, Sinha established his scientific reputation and rose to national prominence on the strength of his stellar scientific contributions. Throughout his long and eventful life, Sinha was a maverick genius. His knowledge was astonishingly broad. He received many honors, including the most prestigious Shanti Swarup Bhatnagar award in 1972. Sinha was elected fellow of the Indian Academy of Sciences, Bengaluru in 1974 and the Indian National Science Academy, New Delhi in 1978.

At NCL, Sinha assembled a formidable team of inorganic and physical chemists and worked on high-temperature superconductors, ultrapure silicon and electrochemistry-related research. Through his works he has proved that a scientist, however much deeply engrossed in fundamental sciences, can take on practical problems of national relevance.

After producing more than 50 fine Ph.D. students and publishing a large number of impactful papers in the field of solid-state materials chemistry, Sinha retired from NCL in 1988. Following his retirement, he along with his family moved to sunny California, USA. Even after retirement, he was actively engaged with the Morris Innovative Research at Berkeley, California. Sinha was a beloved husband, father, grandfather and friend. He is survived by his wife, two children and two grandchildren.

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