

Nikola Kallay

(1942 – 2015)

PROFESSOR Nikola Kallay, a distinguished Croatian chemist, Professor emeritus at the University of Zagreb, a full member of the Croatian Academy of Sciences and Arts and the Editor-in-Chief of *Croatica Chemica Acta* died on 20 April 2015 in his summerhouse near Zagreb at the age of 72. All his colleagues from Croatia and abroad were shocked and deeply saddened to learn of his sudden passing away and of the end of his long and successful scientific career. He will be remembered not only as a devoted scientist, but also as a teacher and as a true friend.

Nikola Kallay was born in Zagreb (Croatia) on 5 September 1942. In 1967 he graduated in chemical engineering at the Faculty of Technology, University of Zagreb. In 1969 he joined the Institute of Physical Chemistry (later the Institute of Chemistry) as a Research Assistant in the group of Professor Božo Težak. He obtained his M.Sc. and Ph.D. degrees in chemistry at the Department of Chemistry, Faculty of Science, University of Zagreb in 1972 and 1973, respectively, writing both theses on the physical chemistry of colloid systems. In 1978, he received his habilitation degree in physical chemistry at the same University continuing up the ladder and attaining finally full professorship in 1996 and the honorary position of a Professor emeritus after his retirement in 2013. In 2006 he was elected an associate member and in 2008 a full member of the Croatian Academy of Sciences and Arts. During his employment at the Faculty of Science Nikola Kallay served as Vice-Dean (1982), Head of the Division of Physical Chemistry (1999 and 2007–2011) and Head of the Department of Chemistry (2001–2005).

Professor Nikola Kallay, whose work was very well recognized by the scientific community, as well as by his students, received many awards: the Ruđer Bošković



Nikola Kallay as Editor-in-Chief of *Croatica Chemica Acta*.

Award of the Republic of Croatia for scientific achievement (1992), the Award for Scientific Achievement of the Croatian Academy of Sciences and Arts (1999), the Award of the City of Zagreb for Scientific Accomplishments (2000), the Outstanding Lecturer Award, Pacific Northwest National Laboratory (2010), the Gold Plaque of the University of Nova Gorica, Slovenia (2011), the Medal of the Department of Chemistry of the Faculty of Science (2012), the „Božo Težak” Medal of the Croatian Chemical Society (2013) and the National Award for Lifetime Achievements in the field of natural sciences (2013).



Logo of the Croatian Chemical Society.
Original drawing by Nikola Kallay.



Nikola Kallay in the laboratory of colloid chemistry at the Division of Physical Chemistry, Department of Chemistry, Faculty of Science.

Nikola Kallay was the president of the Croatian Chemical Society in the period from 1994 to 1996, and from 2006 until 2015 he was the Editor-in-Chief of the Croatian most renowned chemical journal *Croatica Chemica Acta*. He strived to maintain and improve the already high level and international reputation of the journal. Bearing witness to his many talents it is interesting to mention that he designed the logo of the Croatian Chemical Society, which is now an essential part of This Journal's visual identity.

Professor Kallay was very active in science and education. His scientific research was focused on the physical chemistry of colloids and interfaces both by developing theoretical models and experimental methods. Within the physical chemistry of colloids and interfaces he was investigating the following topics: **the electrical interfacial layer** (a general model of the electrical interfacial layer, capacitors within the interfacial layer, association of counterions, standard states and activities of interfacial species, enthalpies of interfacial reactions, the surface complexation model, a molecular model of colloid particles, simultaneous interpretation of experimental data, development of methods for determining points of zero charge, isoelectric points and surface potentials, *etc.*); **adsorption** (activities of interfacial species, adsorption isotherms, interpretations of adsorption data, *etc.*); aggregation and colloid stability (kinetics, antagonistic effects, introduction of the surface complexation model, stabilities of nano-dispersions, *etc.*); adhesion (kinetics of deposition and release, surface saturation, development of multilayers, effects of magnetic field, *etc.*); **surface active agents** (solubility, enthalpies of

dissolution, heat capacities, charge fluctuations and conductivities of microemulsions, counterion associations, *etc.*); **crystal growth and dissolution** (kinetics and mechanisms); **electrolyte solutions** (ion pairing); **applications** (corrosion, drug formulation, dissolutions of polyester fibers, scale deposition, preparation of colloid particles, isoelectric point of metal particles, *etc.*).

During his career, Nikola Kallay's efforts centered on solving fundamental problems, but he never refrained from applying fundamental knowledge in solving many practical problems. His scientific work was very fruitful, filled with solving scientific puzzles by developing and refining theoretical models and by designing new, innovative experimental methods. Let us list just a few examples illustrating his rich scientific interest: He introduced the „Molecular Model” in treating the colloid particles as „multivalent molecules”, solved the problem of the reduction of available surface areas (caused by aggregation during experiments) by the application of ultrasound, investigated the effect of lyotropic series on charging of a surface and introduced the concept of the association space being determined by the distance of closest approach and the Bjerrum critical distance. Nikola Kallay developed the adhesion method for the determination of isoelectric points, the single crystal electrode for evaluation of inner surface potentials and improved the mass titration method for determination of the point of zero charge and surface charge densities. He developed the experimental methods for characterization of interface and the simultaneous theoretical interpretation of various types of data. Last but not least, he even spent his

last working day in the lab with his student trying to measure the non-faradaic current between two single crystal metal oxide electrodes.

Nikola Kallay published more than 160 scientific articles in the field of physical chemistry, 3 monographs, 6 textbooks and more than 30 other papers. His articles were cited more than 2500 times. He published several monographs and textbooks and was the editor (and contributing author) of *Interfacial Dynamics*. At international scientific conferences and during his numerous visits to various institutions, Kallay delivered more than 70 invited lectures. He closely collaborated with Professor Egon Matijević at Clarkson University (Potsdam, NY, USA) spending the academic year 1980/81 there, and subsequently spending three months each year at Clarkson as a visiting professor until 1990. Nikola Kallay was the principal investigator of many national and international projects and he collaborated closely with the colleagues from many internationally recognized institutions such as Maria Curie-Skłodowska University in Lublin, Poland; Jožef Stefan Institute, Ljubljana, and the University of Nova Gorica, Slovenia; Research Centre Jülich and Karlsruhe Institute of Technology, Germany; Pacific Northwest National Laboratory, Richland, WA, USA; the University of Szeged, Hungary, etc. As acknowledgment, gratitude and appreciation of the fruitful collaboration with Professor Nikola Kallay the Polish Chemical Society devoted to him a *Memorial Session* at the 9th International Symposium *On Effects of Surface Heterogeneity in Adsorption and Catalysis on Solids* (ISSHAC-9) in Wrocław, Poland, in July 2015.

Professor Kallay was also a member of the Croatian Chemical Society (HKD) since 1973. With one of us (TC) he began to study the problem of physical quantities and units. Within the Society, the Commission on Terminology, Units, and Symbols has been founded and started communications with international organizations. In 1974 TC and NK wrote a proposal of recommendations on terminology and symbols of physical quantities and units based upon existing international recommendations, which was critically reviewed by 30 Croatian chemists and physicists. On the basis of the many valuable comments the text was revised and accepted as the official recommendations of HKD and published in 1975 under the title „*Physical quantities and units of the International system*” (*Fizičke veličine i jedinice Međunarodnog sustava*). At that time Professor Max McGlashan, one of the leading authorities on measurement, symbols and units in chemistry, visited Zagreb and on seeing the proofs of the book and Nikola Kallay's expertise in this field he arranged for Nikola Kallay to become a Titular Member of the IUPAC Commission on Symbols, Terminology and Units (STU) within the Physical Chemistry Division (PCD) in 1977. Already at the next IUPAC General Assembly in 1979 Kallay proposed a revision of the IUPAC

Manual on Quantities and Units along the lines of the Croatian recommendations. This was initially rejected, but then Kallay extended the justifications and repeated the proposal in 1981, gained some support so that in the third attempt in 1983 at the General Assembly in Lyngby it was accepted as a high priority IUPAC-PCD project, the initial Working Party consisting of Kozo Kuchitsu (Tokyo), Ian Mills (Reading), Nikola Kallay (Zagreb) and Klaus Homann (Darmstadt). In September 1984 Ian Mills decided to visit Zagreb after a conference in Prague and the first outline of the IUPAC Manual was thus prepared jointly by Kallay, Cvitaš and Mills based on the card-collection of physical quantities and units compiled in Zagreb. The Working Party had its first meeting in Reading in March 1985. In 1985 at the General Assembly in Lyon TC also joined the Working Party and the Commission STU. The full Working Party met once more in Dubrovnik in 1986 to prepare the final version of the manual. The correspondence with related Commissions of IUPAC lasted some two years and in 1988, IUPAC published what has become its most successful publication to date: *Quantities, Units, and Symbols in Physical Chemistry*, commonly known as the *Green Book*. Practically all well-known journals in the world use the standards of the *Green Book*, and it has been translated into 8 languages. As a result of his work on IUPAC's *Green Book*, Kallay was elected to several bodies – the IUPAC Interdivisional Committee on Nomenclature and Symbols (IDCNS/IUPAC) and other related international bodies such as the International Union of Pure and Applied Physics (IUPAP), the Comité Consultatif des Unités of the Bureau International des Poids et Mesures (Sèvres, Paris), and the International Organization for Standardization (ISO).

Professor Nikola Kallay was also a devoted teacher. He taught Physical Chemistry and Colloid Chemistry at the Faculty of Science, University of Zagreb for many years. He was a supervisor to almost 50 diploma students, 10 master



The IUPAC Interdivisional Committee on Nomenclature and Symbols (IDCNS/IUPAC) around 1985: Klaus Homann, Kozo Kuchitsu, Ian Mills and Nikola Kallay.

students and 10 Ph.D. students. He put a lot of effort toward the development of the Department of Chemistry devoting particular attention to students. In order to offer higher recognition to outstanding students and stimulate hard work, he introduced medals to be awarded by the Department. Since 2005 the medals have been awarded to students with outstanding grades as well as to distinguished professors. Nikola Kallay himself obtained the same medal

in 2012. Engraved on the back of the medal is the motto with which we would like to conclude:

Vivit post funera virtus

*Tajana Preočanin
Davor Kovačević
Tomislav Cvitaš*