CROATICA CT CHEMICA

HKD 1926

Svetozar Musić – *Curriculum Vitae*

DR. SVETOZAR MUSIĆ was born in Skopje on 18 July 1946. He graduated in physical chemistry from the Department of Chemistry, Faculty of Science, University of Zagreb in 1970. In the same year he started postgraduate studies in physical chemistry and radiochemistry and received MSc degree in 1972. In 1978 he earned PhD degree in physical chemistry from the Faculty of Science, University of Zagreb.

Dr. Musić started his scientific career with Prof. Mirko Mirnik in the Laboratory for Radiochemistry at the Ruđer Bošković Institute (RBI) working on his MSc thesis immediately after graduation. Under the supervision of Prof. Mirnik he developed an electrochemical method which enabled him to determine with great precision the adsorption of constituent ions Ag^+ and I^- on AgI under different conditions. Selected results were published in the journal *Progress in Colloid and Polymer Science* 1976, *61*, 36. This article had a significant impact on the understanding of colloid stability nature. These results also confirmed the validity of previous results of Professors Marko Herak, Velimir Pravdić and Egon Matijević obtained on the same system using the radiochemical adsorption of Eu^{3+} counterions on AgI (M. Herak), streaming potential on AgI (V. Pravdić) and coagulation of AgI sol (E. Matijević). Dr. Musić continued this study by investigations of the adsorption/desorption equilibria of metal oxides using radiochemical methods, which resulted in a series of publications in international journals (*e.g.,* S. Musić *et al*., *Microchim. Acta (Wien),* 1978 *II,* 303.*;* S. Musić *et al., Microchim. Acta (Wien), I (1979) 95.;* S. Musić *et al., Z. Wasser-Abwasser Forsch. 19 (1986) 186.;* S. Musić, M. Ristić, *J. Radioanal. Nucl. Chem. 120 (1988) 289*.). In that period he also investigated the labeling of different colloids and complexes with short-lived radioisotopes for application in nuclear medicine (*e.g.,* S. Musić, M. Vlatković, *Acta Pharm*. 26 (1976) 313.; S. Musić *et al*. *Period. Biol.* 80 (1978) 145.). He prepared a short-lived radioisotope Ru-97 at the RBI cyclotron by irradiating a sheet of molybdenum with the internal α-beam of the cyclotron and obtained an EOB value radioactive enough for application in nuclear medicine. He also created original chemical reactions for the separation of this radioisotope from the cyclotron target and its transfer to the chemical form adequate for application in medical diagnostics (M. Gessner *et al., J. Appl. Radiat. Isotopes* 30 (1979) 578.; S. Musić, M. Gessner, *Radioakt. Isot. Klin. Forsch*. 14 (1980) 165.).

As a research fellow in the period 1976–1977 at the Institute of Physical Chemistry and Radiology, Loránd-Eötvös University in Budapest, Dr. Musić worked with Academician Attila Vértes and Dr. Ilona Czakó-Nagy on the application of Mössbauer spectroscopy. In that time Dr. Musić started systematic investigations of metal oxides and mixed metal oxides which include synthesis, kinetics, phase transformations and formation mechanisms. The unique approach and obtained results, found high response in the international scientific community. This approach was an extension to the investigations of the Zagreb School of Colloid Chemistry, where little attention was paid to the influence of phase transformations on the colloidal properties of materials. Dr. Musić's approach has been fully corroborated in a number of present-day investigations in materials science (nanomaterials and their application in nanotechnologies).

In the period 1980–1982 Dr. Musić was a visiting scientist at the Lehigh University, Bethlehem, Pennsylvania, owing to the scholarship of the Office of Naval Research, Department of Defense, USA and the invitation by Prof. Henry Leidheiser, who at the time was the director of the Center for Surface and Coatings Research. Dr. Musić worked with Professors Henry Leidheiser and Gary W. Simmons. As a result of the investigations at the Lehigh University he published eight scientific papers (in journals *Nature*, *J. Coll. Interface Sci*., *J. Electrochem. Soc*., *Corrosion Sci*. and *Radiochem. Radioanal. Lett*.). Also, worth mentioning is his work on Mössbauer emission spectroscopy, which is used by a limited number of scientists in the world. This method involves a good knowledge of radiochemistry which he obtained at the beginning of his scientific career.

Dr. Musić opened new fields of scientific research in Croatia, as well as new fields of investigations in the chemistry of metal oxides and mixed metal oxides, oxide glasses and glass-ceramics, with emphasis on the application of different spectroscopic methods (Mössbauer, FT-IR, Raman, UV/Vis/NIR) to the studies of these materials. The influence

of various parameters on the kinetics, phase transformation and mechanisms of the formation of solid phases from solutions has been broadly studied. Among other things, the suggested mechanism of solid (oxide) phase formation by the forced hydrolysis of Fe^{3+} ions in solutions containing different anions (S. Musić *et al*., *J. Coll. Interface Sci*. 85 (1982) 256.) was especially well accepted by the scientific community. This publication was later used by Dr. Musić and his co-workers as a base for numerous investigations into kinetics of iron oxide precipitation and the mechanism of their phase transformations.

Together with Dr. Mira Ristić and Dr. Stjepko Krehula, Dr. Musić recently published a chapter under the title *57-Fe Mössbauer spectroscopy in the investigation of the precipitation of iron oxides* in the book *Mössbauer Spectroscopy: Application in Chemistry, Biology, Industry and Nanotechnology* (editors V. K. Sharma, G. Klingelhofer, T. Nishida), John Wiley & Sons 2013, pp. 470–504. This chapter is mainly based on the invited lecture held by Dr. Musić in 2010 at the American Chemical Society's National Meeting in San Francisco.

Dr. Musić and co-workers synthesized TiO_2 nanoparticles and established a new method for the determination of their size distribution using low-frequency Raman scattering (*Mater. Lett*. 28 (1996) 225.; *Mater. Sci. Eng*. B47 (1997) 33.). This method received many recognitions in scientific literature. In recent times the research by Dr. Musić has included investigation into nano/microstructural films and their physical properties which is important for their application, especially in optoelectronics.

Dr. Musić and his co-worker have also started with the syntheses of metal oxides in the form of long nanowires using the electrospinning method The properties of electrospun metal oxide fibers on the electrospinning conditions have been studied (*e.g.,* Ristić *et al*. *Croat. Chem. Acta 87 (2014) 315*.; Ristić *et al*. *Mater. Lett. 156* (2015) 142.).

Among Dr. Musić's numerous papers special mention should be given to those about the formation of the ferrites of spinel, perovskite or garnet crystal structure (*e.g.,* S. Musić *et al., Croat. Chem. Acta 70* (1997) 719.; M. Gotić *et al., J. Mol. Struct. 924–926* (2009) 347.; M. Ristić *et al., Croat. Chem. Acta 73* (2000) 301.; M. Ristić *et al., J. Alloys Comp.* 256 (1997) 27.), and the formation of solid solutions in mixed metal oxides (*e.g.*, S. Musić *et al., J. Mater. Sci., 31* (1996) 4967.).

A new synthesis of uniform goethite (α-FeOOH) particles was reported (S. Krehula *et al.*, *Mater. Lett. 54* (2002) 108.), as well as the influence of various metal cations on the nano/microstructural and phase changes in this precipitation system (*e.g.*, S. Krehula, S. Musić, *J. Alloys Comp. 416* (2006) 284.; S. Krehula, S. Musić, *J. Alloys Comp. 516* (2012) 207.; S. Krehula *et al.*, *J. Alloys Comp. 658* (2016) 41.).

The formation of solid solutions in mixed metal oxides between ZrO_2 and various metal cations with special focus on the stability of low temperature tetragonal ZrO_2 was investigated (*e.g.,* S. Popović *et al.*, *J. Alloys Comp. 241* (1996) 10.; G. Štefanić, S. Musić, *Croat. Chem. Acta 75* (2002) 727.; G. Štefanić *et al., J. Mol. Struct. 480–481* (1999) 627.). The influence of milling media on the structural and microstructural changes in monoclinic ZrO_2 was also reported (G. Štefanić *et al.*, *J. Eur. Ceram. Soc. 27* (2007) 1001.).

Dr. Musić published over 280 original scientific papers in journals cited by the *Current Contents*, along with numerous papers in other journals, which were cited more than 4200 times (self-citations excluded).

Dr. Musić was a member of scientific and/or program committees at many international scientific conferences. He was a chairman of two international conferences, the *29th European Congress on Molecular Spectroscopy (EUCMOS 2008)*, Opatija, Croatia, 2008, and the *International Conference on the Applications of the Mössbauer Effect (ICAME 2013)*, Opatija, Croatia, 2013. He also served as a representative of Croatia on the International Board on the Applications of Mössbauer Effect, IBAME (1994–2012).

In honour of Dr. Musić the international scientific conference *Mediterranean Conference on the Applications of the Mössbauer Effect (MECAME 2015)* was held in Zadar in June 2015. Renowned scientists from 21 countries participated in this conference.

Dr. Musić founded a Group for Metal Oxides at the RBI. He was the first head of the Laboratory for the Synthesis of New Materials (LSNM). He was also a director of the scientific research program *Science and technology of materials*. On the basis of this program he founded the Division of Materials Chemistry (DMC) of which he was the head from 1996. until his retirement in 2011. He was a member of the Election Board in Chemistry at the RBI from 1983 to 2011 and an assistant director of the RBI (2000–2002). He was the head coordinator of the program *New functional materials*, one of the largest research programs (15 projects) in Croatia which included many researchers from the RBI, the Faculty of Electrical Engineering and Computing and the Faculty of Chemical Engineering and Technology.

Dr. Musić, together with Prof. Tajana Preočanin, teaches a course *Selected Chapters of Surface and Colloid Chemistry* at the Faculty of Science. He also conducted a course *Spectroscopic Methods in Materials Research* at the Faculty of Chemical Engineering and Technology. Dr. Musić successfully led 18 MSc and PhD students who today hold high scientific ranks and important roles in Croatia and elsewhere.

Dr. Musić participated in the building of new laboratories at the RBI (Wing No. 10) by working on large industrial projects. These laboratories are today also used by other RBI divisions besides the Division of Materials Chemistry.

He was also engaged in the acquisition and installation of capital equipment, field emission scanning electron microscope (Jeol JSM-7000F) which has been installed in 2005. In that time this instrument was the only electron microscope of its kind in Croatia.

Dr. Musić also acquired and installed the following research equipment in LSNM: X-ray powder diffractometer, Fourier transform infrared spectrometer in mid and far IR regions and UV-Vis-NIR spectrometer equipped with an integrated sphere for the measurement of optical properties of solid compounds and solutions. He installed two Mössbauer spectrometers which are the only research instruments of their kind in Croatia. Besides that, Dr. Musić acquired many small equipment items needed for the research of materials. Instrumentation acquired and installed by Dr. Musić resulted in a significantly improved quality of scientific investigations related to the field of materials chemistry and physics at the RBI.

Dr. Musić was a member of the Committee for nuclear safety of the Parliament of the Republic of Croatia as well as a member of the Croatian team for monitoring and solving the problem of radioactive waste disposal and decommissioning of the Krško nuclear power plant. He also served as an expert for the International Atomic Energy Agency (Vienna).

In 2006 Dr. Musić was awarded by the Croatian Academy of Arts and Sciences (HAZU) for his remarkable scientific achievements and in 2010 was elected as Associate Member of the HAZU (Division for Mathematics, Physics and Chemistry). In 2012 he became emeritus at the Ruđer Bošković Institute.

Mira Ristić
Stjepko Krehula