

Surface Chemistry in Biomedical and Environmental Science

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Surface Chemistry in Biomedical and Environmental Science

edited by

Jonathan P. Blitz

Eastern Illinois University,
Charleston, IL,
U.S.A.

and

Vladimir M. Gun'ko

Institute of Surface Chemistry,
Kiev,
Ukraine



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Professor A. A. Chuiko[†], NATO ARW co-director from which these proceedings are derived, died on the 16th of January, 2006. His outstanding contributions to the fields of physical chemistry, physics, chemistry and solid surface technologies will be a lasting legacy. Professor Chuiko obtained his Doctorate in Chemical Sciences in 1972. Since 1988 he was an academician of the National Academy of Sciences of Ukraine. Some activities and awards during his career include being an active member of the Academies of Technological Sciences of Ukraine and Russian Federation, an Honored Scientist and Technologist of Ukraine, a laureate of the State Prize of UkrSSR in Science and Engineering and the Pisarzhevsky Prize, and the President of the Ukrainian Chemical Society. Professor Chuiko in 1986 was a founder and permanent Director of the Institute of Surface Chemistry of the National Academy of Sciences of Ukraine, a world renowned research organization in which he was a driving force.

A. A. Chuiko[†] expended considerable effort to the training of young scientists, having trained more than 100 Ph.D. and Doctors of Sciences students.

A. A. Chuiko[†] and his co-workers developed fundamentals of modern surface chemistry of ultra-dispersed solids, new types of functional nanomaterials, and founded a new direction in pharmacology based on nanomaterials. His comprehensive creative activity was characterized by deep intuition and understanding of new and perspective directions in chemical science. Many of his projects led to industrial materials production.

Prof. Chuiko was a positive force in many people's lives. He is remembered as an outstanding and talented scientist, a man of deep erudition possessing a sharp and ever active mind. He was a man of inexhaustible energy, initiative, and wisdom. His sincere generosity will remain in the hearts of his colleagues.

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PREFACE

This volume details work presented at the NATO Advanced Research Workshop entitled “Pure and Applied Surface Chemistry and Nanomaterials for Human Life and Environmental Protection” held in Kiev, Ukraine, September 14-17, 2005. A total of 39 selected works have been compiled detailing research in three categories all related to the surface chemistry of nanomaterials: fundamentals, biomedical applications for human life, and environmental protection.

There exists great hope throughout the scientific community for the application of nanotechnologies to solve myriad technological problems. Nanomaterials and nanoparticles exhibit unique properties which are now being explored for potential uses, as well as hazards. Given the scale of nanomaterials surface chemistry inevitably plays a huge role in their properties, since most of these materials are largely comprised of surface. The synthesis of nanomaterials ranging from core-shell particles, microencapsulation techniques, molecular layering of nanoparticles, mixed oxide nanoparticles, carbon nanoparticles, hybrid carbon/mineral nanoparticulate and functionalized materials, as well as artificial polymer biomaterials filled by modified nanoparticles, catalysts, etc. are all topics that are discussed.

A common theme throughout this volume involves the adsorption and interfacial, especially biointerfacial, behaviour of all of the above mentioned nanomaterials. For environmental and human protection, the adsorption of heavy metal ions, toxins, pollutants, drugs, chemical warfare agents, narcotics, etc. is often desirable. A healthy mix of experimental and theoretical approaches to address these problems is described in various contributions. In other cases the application of materials, particularly for biomedical applications, requires a surface rendered inactive to adsorption for long term biocompatibility. Adsorption, surface chemistry, and particle size also plays an important role in the toxicological behaviour of nanoparticles, a cause for concern in the application of nanomaterials. Each one of these issues is addressed in one or more contributions in this volume.

We believe this volume holds a special niche in describing the current state of the art in the fundamentals and applications of a variety of nanomaterials. We thank all of the authors for their fine contributions, which make us proud to be editors of this book. We also thank the NATO Security Through Science Program for making the workshop and this series volume possible, for which we are most grateful. We sincerely hope you will find this volume useful.

January, 2006

Professor Jonathan Blitz – Charleston, IL, USA

Professor Vladimir Gun'ko – Kiev Ukraine

Co-editors

LIST OF CONTRIBUTORS

1. M. CHAPLIN

London South Bank University, Borough Road, London SE1 0AA, UK

2. B. VINCENT

School of Chemistry, University of Bristol, Bristol, BS8 1TS, UK

3. D. PONCELET

ENITIAA, Rue de la Géraudière BP 8225, 44322 Nantes Cedex 3, France

4. A. A. MALYGIN

Saint-Petersburg Institute of Technology (Technical University), 26 Moskovskii pr., Saint-Petersburg, Russia

5. G. ERTAS, S. SUZER

Bilkent University, Department of Chemistry and the Laboratory for Advanced Functional Materials, 06800 Ankara, Turkey

6. O. GERSHEVITZ, P. SILICKAS, C. N. SUKENIK

Department of Chemistry, Bar-Ilan University, Ramat Gan, ISRAEL 52900

7. M. S. MEL'GUNOV, V. B. FENELONOV

Boriskov Institute of Catalysis SB, RAS, Prospekt Akad. Lavrentieva 5, Novosibirsk, 630090, Russian Federation

8. V. B. FAINERMAN,¹ V. I. KOVALCHUK,² D. O. GRIGORIEV,³ M. E. LESER,⁴
AND R. MILLER³

¹*Medical Physicochemical Centre, Donetsk Medical University, 16 Ilych Avenue, 83003 Donetsk, Ukraine*

²*Institute of Biocolloid Chemistry, 42 Vernadsky avenue, 03680 Kyiv (Kiev), Ukraine*

³*Max-Planck-Institut für Kolloid- und Grenzflächenforschung, 14424 Potsdam/Golm, Germany*

⁴*Nestec Ltd., Nestlé Research Centre, Vers-chez-les-Blanc, CH-1000 Lausanne 26, Switzerland*

9. V. GUN'KO,¹ R. LEBODA,² V. TUROV,¹ V. ZARKO,¹ A. CHUIKO^{1†}

¹*Institute of Surface Chemistry, 03164 Kiev, Ukraine,*

²*Maria Curie-Skłodowska University, 20031 Lublin, Poland*

10. Y. BOLBUKH,¹ V. TERTYKH,¹ B. GAWDZIK²

¹*Institute of Surface Chemistry of National Academy of Sciences of Ukraine, Gen. Naumov Str. 17, 03164 Kyiv, Ukraine*

²*Faculty of Chemistry, Maria Curie-Skłodowska University, M.C. Skłodowska Sq. 3, 20031 Lublin, Poland*

11. L. G. GRECHKO,¹ L. B. LERMAN,¹ O. YA. POKOTYLO,¹ N. G. SHKODA,¹
A. A. CHUIKO[†],¹ K. W. WHITES²

¹*Institute of Surface Chemistry, 17 General Naumov Street, Kyiv 03164, Ukraine*

²*South Dakota School of Mines and Technology, Rapid City, South Dakota 57701-3995, USA*

12. J. SKUBISZEWSKA-ZIĘBA,^a R. LEBODA,^a V. M. GUN'KO,^b B. CHARMAS^a
^a*Maria Curie-Skłodowska University, Maria Curie Skłodowska Sq.3, 20-031 Lublin, Poland*

^b*Institute of Surface Chemistry, 17 General Naumov Street, 03164 Kiev, Ukraine*

13. J. SKUBISZEWSKA-ZIĘBA,^a R. LEBODA,^a V. M. GUN'KO,^b O. SELEDETS^a
^a*Maria Curie-Skłodowska University, Maria Curie Skłodowska Sq.3, 20-031 Lublin, Poland*

^b*Institute of Surface Chemistry, 17 General Naumov Street, 03164 Kiev, Ukraine*

14. H. J. MATHIEU,¹ X. GAO,¹ Y. CHEVOLOT² D. J. BALAZS³

¹*École Polytechnique Fédérale de Lausanne (EPFL)-IMX, Station 12, CH-1015 Lausanne, Switzerland*

²*Equipe Biotechnologie, UMR 5512 CNRS/ECL, Lyon/France*

³*Swiss Federal Lab. of Materials Testing and Research, EMPA-St. Gallen/Switzerland*

15. W. NORDE

Laboratory of Physical Chemistry and Colloid Science, Wageningen University, Dreijenplein 6, 6703 HB Wageningen, and University Medical Centre Groningen, University of Groningen, Antonius Deusinglaan 1, Groningen, The Netherlands

16. V. M. GUN'KO, V. V. TUROV, A. A. CHUIKO[†]

Institute of Surface Chemistry, 17 General Naumov Street, 03164 Kiev, Ukraine

17. A. CHUIKO[†],¹ A. PENTYUK,² E. SHTAT'KO,² N. CHUIKO³

¹*Institute of Surface Chemistry, 17 Generala Naumova Str., Kyiv 03164, Ukraine*

²*Vinnitsa State Medical University, 56 Pirogova Str., Vinnitsa 21018, Ukraine*

³*Institute for Occupational Health of the Academy of Medical Sciences of Ukraine, 75 Saksaganskogo Str., Kyiv 01033, Ukraine*

18. S. L. JAMES,¹ M. ILLSLEY,² S. E. JAMES,² E. MENDOZA,³ S. R. P. SILVA,³
P. VADGAMA,⁵ P. TOMLINS,⁴ S. V. MIKHALOVSKY¹

¹*School of Pharmacy and Biomolecular Science, University of Brighton, Moulsecoomb, Brighton BN2 4GJ, UK*

²*Blond McIndoe Centre, Queen Victoria Hospital, East Grinstead RH19 3DZ, UK*

³*Nano-electronics centre, Advanced Technology Institute, University of Surrey, Guildford GU2 7XH, UK*

⁴*Materials Centre, National Physical Laboratory, Queens Road, Teddington, Middlesex TW11 0LW, UK*

⁵*IRC in Biomedical Materials, Queen Mary, University of London, Mile End Road, London E1 4SN, UK*

19. P. V. GRANT,¹ C. M. VAZ,¹ P. E. TOMLINS,¹ L. MIKHALOVSKA,²
S. MIKHALOVSKY,² S. JAMES,² P. VADGAMA³

¹*Division of Engineering and Process Control, National Physical Laboratory, Hampton Road, TW11 0LW, United Kingdom*

²*Department of Pharmacy and Biomolecular Sciences, University of Brighton, Cockcroft Road, Brighton, BN2 4GJ, United Kingdom*

³*IRC in Biomedical Materials, Queen Mary, University of London, Mile End Road, London, E1 4NS, United Kingdom*

20. A. SPANOUDAKI, D. FRAGIADAKIS, K. VARTZELI-NIKAKI, P. PISSIS,
J. C. RODRIGUEZ HERNANDEZ[†], M. M. PRADAS[†]

Department of Physics, National Technical University of Athens, 15780 Athens, Greece

[†]*Center for Biomaterials, Universidad Politecnica de Valencia, E-46071 Valencia, Spain*

21. B. FUBINI,¹ I. FENOGLIO, G. MARTRA,¹ R. CESCHINO,¹ M. TOMATIS,¹
R. CAVALLI,² M. TROTTA²

¹*Dip. di Chimica Inorganica, Chimica Fisica e Chimica dei Materiali and Inter-departmental Centre "G. Scansetti" for Studies on Asbestos and Other Toxic Particulates, University of Torino, via Pietro Giuria 7, 10125 Torino, Italy*

²*Dip. di Scienza e Tecnologia del Farmaco, University of Torino, via Pietro Giuria 9, 10125 Torino, Italy*

22. O. V. SHULGA, C. PALMER

Department of Chemistry, University of Montana, Missoula, MT 59812, USA

23. J. BARKAUSKAS

Vilnius University, Naugarduko 24, 03225 Vilnius, Lithuania

24. V. A. POKROVSKIY, N. P. GALAGAN, A. A. CHUIKO[†]

Institute of Surface Chemistry, 17 General Naumov Street, 03164 Kiev, Ukraine

25. I. FENOGLIO, M. GHIAZZA, R. CESCHINO, F. GILLIO, G. MARTRA,
B. FUBINI

Dip. di Chimica Inorganica, Chimica Fisica e Chimica dei Materiali and Inter-departmental Centre "G. Scansetti" for Studies on Asbestos and Other Toxic Particulates and Centre of Excellence of Nanostructured Interfaces and Surfaces (NIS) University of Torino, via Pietro Giuria 7, 10125 Torino, Italy

26. P. P. GORBIK,¹ L. P. STOROZHUK,¹ A. A. CHUIKO,^{1†} L. Yu. VERGUN,²
V. F. CHEKHUN³

¹*Institute of Surface Chemistry 17 General Naumov Street, Kyiv 03164,* ²*Institute of Hematology and Transfusiology, 12 Berlinskiy Street, Kyiv 04060,* ³*Kavetsky Institute of Experimental Pathology, Oncology and Radiobiology, 45 Vasyl'kivska Street, Kyiv 03022, Ukraine*

27. P. KUZEMA, O. STAVINSKAYA, O. KAZAKOVA, I. LAGUTA
Institute of Surface Chemistry of National Academy of Sciences of Ukraine, 17 General Naumov Street, Kyiv, 03164, Ukraine
28. O. TSENDRA, A. DATSYUK, V. LOBANOV, A. GREBENYUK, A. CHUIKO[†]
Institute of Surface Chemistry, 17 General Naumov Street, Kiev 03164, Ukraine
29. M. JARONIEC, O. OLKHOVYK
Department of Chemistry, Kent State University, Kent, Ohio 44242, USA
30. I. P. BLITZ, J. P. BLITZ, V. M. GUN'KO¹, D. J. SHEERAN
Eastern Illinois University, Charleston, IL 61920 USA
¹*Institute of Surface Chemistry 03164 Kiev, Ukraine*
31. H. KNÖZINGER
Department Chemie und Biochemie, Universität München, Butenandtstrasse 5-13, Haus E, 81377 München, Germany,
32. BURCU MIRKELAMOGLU, GURKAN KARAKAS
Department of Chemical Engineering, Middle East Technical University, 06531 Ankara, Turkey
33. S. BARANY,¹ J. GREGORY,² A. SHCHERBA,³ I. SOLOMENTSEVA³
¹*University of Miskolc, Institute of Chemistry, H-3515 Miskolc-Egyetemváros, Hungary*
²*University College London, Gower Street, London, WC1E 6BT, UK*
³*Institute for Electrodynamics, National Academy of Sciences of Ukraine, Kiev, Ukraine*
34. W. JANUSZ, M. MATYSEK
Department of Radiochemistry and Colloid Chemistry, Maria Curie Skłodowska University, pl. M. C. Skłodowskiej 3, 20-031 Lublin, Poland
35. K. LÁSZLÓ,¹ K. KOSIK,¹ E. WILK,¹ E. GEISSLER²
¹*Department of Physical Chemistry, Budapest University of Technology and Economics, Budapest 1521, Hungary*
²*Laboratoire de Spectrométrie Physique CNRS UMR5588, Université J. Fourier de Grenoble, BP 87, 38402 St Martin d'Hères, France*
36. A. M. VOLODIN,¹ A. F. BEDILO,¹ D. S. HEROUX,² V. I. ZAIKOVSKII,¹
I. V. MISHAKOV,¹ V. V. CHESNOKOV,¹ K. J. KLABUNDE³
¹*Boreskov Institute of Catalysis, Novosibirsk, 630090, Russia;*
²*Department of Natural Sciences, University of Maine at Farmington, Farmington, ME, USA;*
³*Department of Chemistry, Kansas State University, Manhattan, KS, USA, 66506*

37. D. PALIJCZUK,^a R. SZMIGIELSKI,^a V. M. GUN'KO,^b R. LEBODA^c
^a*Military Institute of Chemistry and Radiometry, 00-910 Warsaw, Poland,*
^b*Institute of Surface Chemistry, 17 General Naumov Street, 03164 Kiev, Ukraine*
^c*Faculty of Chemistry, Maria Curie-Skłodowska University, 3 Maria Curie-Skłodowska Square, 20-031 Lublin, Poland*
38. R. SZMIGIELSKI,^a D. PALIJCZUK,^a R. LEBODA,^b V. M. GUN'KO,^c J. SKUBISZEWSKA-ZIEBA^b
^a*Military Institute of Chemistry and Radiometry, 00-910 Warsaw, Poland,*
^b*Faculty of Chemistry, Maria Curie-Skłodowska University, 3 Maria Curie-Skłodowska Square, 20-031 Lublin, Poland*
^c*Institute of Surface Chemistry, 17 General Naumov Street, 03164 Kiev, Ukraine*
39. V. I. ZARKO,¹ V. M. GUN'KO,¹ L. S. ANDRIYKO,¹ E. V. GONCHARUK,¹ M. MATYSEK,² E. SKWAREK,² W. JANUSZ²
¹*Institute of Surface Chemistry, 17 General Naumov Street, 03164 Kiev, Ukraine*
²*Faculty of Chemistry, Maria Curie-Skłodowska University, 20031 Lublin, Poland*