Resume of prof. Valter SERGO

Born in Udine (Italy) on September, 17th 1960
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Present position: **-SACMI Full professor of "Science and Technology of Ceramic Materials" endowed chair at the Faculty of Engineering, University of Trieste (Italy);**
-Director of the CENMAT, National Center of Excellence for Nanostructured Materials and Surfaces, Trieste

Academic and Professional Education

- High School Degree (final grading 60/60) 1979.
- Certificate of proficiency in English (Michigan State University), 1984.
- University Degree (Laurea) in Chemistry, University of Trieste, (Final grading 110/110), 1985.
- Master of Science in Ceramic Engineering, Ohio State University (USA), 1989.
- Ph. D. in Materials Engineering, Italian Ministry of University and Scientific and Technological Research, 1989.
- Advanced School of Science and Technology of Glass, University of Padova (1990).
- Advanced School of Crystallography, Italian Association of Crystallography, Perugia, (1991).

Professional positions

- Research and Development responsible, Colombin Inc., 1986-87.
- Research associate at the Materials Engineering and Applied Chemistry Department, University of Trieste (Italy) (1990-1998).
- Research associate at the Materials Department, University of California at Santa Barbara (USA)(1993).
- Research associate at the Materials Department, Kyoto Institute of Technology, Kyoto (Japan) (1995 and 1996)
- Associate Professor at the Department of Chemical Engineering, Materials, Raw Materials and Metallurgy (DICMMPM), University "La Sapienza" of Rome (Italy) (1998-2001)
- Visiting professor at the Technical University of Dresden, Germany (2001).
-Associate professor at the Materials Department of the University of Trieste (Italy) (2001-2002).
- SACMI Professor of Science and Technology of Ceramic Materials, Materials Department, University of Trieste, Italy (2002-to date).

Lecturing activity

Since starting the academic career, Prof. Sergo has been lecturing, at the University of Trieste and Rome, for the following courses:

- Chemistry for Engineers;
- Science and Technology of Composite Materials;
-Science and Technology of Ceramic Materials;
-Traditional and Advanced Ceramic materials.

Prof. Sergo has been a lecturer for the "Workshop on Composite Materials" organized by the International Center for theoretical Physics of Trieste in september-october 1991 and for the "Workshop on whiskers and particles technology" organized by the International Center for Science and Technology (1992).. In 1997 and 1999 and 2001 and 2005 he has been the responsible for the courses on "Advanced Ceramic Materials" organized by the Italian Materials Society. In 2003 and 2005 he has been part of the lecturing staff of the course on "Advanced applications of Photonics" held at the international Center of Theoretical physics, Trieste, Italy.

He has been deputy Dean of the Faculty of Engineering, University of Trieste.

Scientific activity

The scientific activity of Prof. Sergo has been mainly devoted to the study of spectroscopic methods for the characterization of advanced ceramic materials for structural and functional applications. The main research areas have been the following:

a) Use of optical spectroscopies for the determination of phases and stresses in ceramic materials (he is the author of a comprehensive review on this subject);

b) Catalytic properties, defects of oxide ceramics.

c) Most recently his research focus is on the use of vibrational spectroscopies (Raman and Infrared) for diagnostic purposes in medicine.

He has published over 100 technical papers. His papers have been cited by the scientific community more than 1500 times with one paper more than 400 times and 2 papers more than 100 times (in the field of Materials Science, the citation treshold of top 1% scientistis is, according to Essential Science indicators, around 600 citations. A joint examination of Scopus and WoS indicates an H-factor of 21 for prof. Sergo). Prof. Sergo is a regular referee of the Journal of the American Ceramic Society and occasional referee of other journals, mainly for papers devoted to spectroscopy of inorganic materials (Biomaterials, Journal of Materials Science, Journal of Materials Research, Applied Spectroscopy, Journal of Applied Physics). He has presented over 50 invited lectures both at scientific meeting and institutions and at industrial companies worldwide.

In 1996 he has been the organizer of an international meeting on residual stresses attended by over 50 international scholars. From 1997 to 1999 he has been the italian responsible for a joint Italian-German research program within the frame of the VIGONI program. In 1999 he has obtained from the University of Trieste a funding for enrolling and directing the research of scientists from the former east block countries. From 2002 he holds a European grant for the implementation of spectroscopic methods in the characterization of materials of medical interest. In 2001 nad 2005 he has been a lecturer on applied spectroscopy techniques and instrumentation in a serie of course organised by the United Nation Industrial Development Organization.

He has been director of the PhD school in Nanotechnology of the University of Trieste (www.nanotech.units.it).

He is Deputy director of the Dept. of Industrial and Information Engineering, University of Trieste (www.dicamp.units.it)

He is presently director of Center of Excellence for Nanomaterials CENMAT, established in 2003 and funded by the Italian Ministry of University and research, MIUR.

He is director of the Scientific Advisory Board of the EC project LONGLIFE, funded by the EC with the aim of developing zirconia with long lasting stability for spinal and dental implant applications. The consortium in charge of the project comprises 12 members, between academy and industry.

Overall Prof. Sergo has had or has in progress collaborations with the following research centers, both academic and industrial:
- Bayreuth University (Germany);
- Technical University of Dresden (Germany);
- Max Planck Institute of Stuttgart (Germany);
- University of California at Santa Barbara (USA);
- Colorado School of Mines (USA);
- Ohio State University (USA);
- Kyoto Institute of Technology (Japan);
- Technical University of Toyohashi (Japan);
- Toray Research Center (Otsu, Japan);
- Seoul National University (Korea);
- Korean Institute for Science and Technology;
-European Materials laboratory of Petten (Holland).
-SACMI Central Laboratory (Italy);
-Siemens Research laboratory (Munich, Germany);
-SNECMA services Laboratory (Melun, France);
-CeramTec Oxide Division (Plochingen, Germany);
-Oxymatec (Stuttgart, Germany);
-Inion Inc (Tampere, Finland)
-CESI Laboratories (Milan, Italy);
-Pirelli Ambiente (Milan, Italy).
-Children Hospital "Burlo Garofolo" Trieste.

Evaluation of scientific and industrial projects

He is a member of the National panel of experts in Materials Science and Engineering (the panel is selected and approved by the Italian Ministry of University and Research, MIUR). As such he has been evaluator and reviewer of industrial research proposals for
-Regione Veneto;
-Regione Emilia Romagna;
-Regione Marche;
- Provincia autonoma di Trento

Prof. Sergo has been an evaluator for the PRIN/COFIN integrated porojects submitted for funding to the Italian Ministry of University and Research, MIUR (2002).

He has been evaluator within the Second PIA "Innovazione" call for industrial research and development projects, submitted for funding to the Italian Ministry for the productive activities (MAP, now Ministry for economic development, MISE). The evaluated projects had budgets in the range of 10 milion euro, contemplating the establishment of new industrial production sites in southern Italy (2005-2009).

He has evaluated several projects within the INTAS call, submitted for funding to the European Commission INTAS projects aimet at the integration of research and industrial partners of former eastern Europe countries into EU networks (2005-2006).

In 2007 and 2008 he has been appointed evaluator for stage 1 and 2 for collaborative projects submitted for funding to the EC within the call NMP-2007-SMALL-1, of the Theme 4 -Nanotechnology- of the 7th Framework Program. In 2009 and 2010 he has been apponted reviewer for large scale, Integratyed Projects funded by EC (project Nanoglowa and project Foremost). IN 2011 he has been evaluator of proposals for the German Aerospace society, DLR).

Technological transfer
In 1995 and 1996 Prof. Sergo has started a strong collaboration with the Toray Industries in Japan, thanks to a liason fostered by the Kyoto Institute of Technology. The collaboration was aimed at the development of spectroscopic tools the the characterization of stresses in ceramic materials. The collaboration has led to the publication of several scientific papers, one of which has received the award for the best publication of the year 1996 of the Japanese Ceramic Society (G. Pezzotti, V. Sergo, K Ota, O. Sbaizero, N. Muraki, T. Nishida and M. Sakai, "Residual Stresses and *Apparent* Strengthening in Ceramic-Matrix Nanocomposites," Journal Japanese Ceramic Society, 104 <6> 497-503 (1996).

In 2000 the European Community has approved the funding of the program HYPERCER for the development of new ceramic materials for biomedical application and even since Prof. Sergo, in partnership with the world leader in the production of ball heads for hyp joint prostheses, CermTec AG (Plochingen Germany) has been responsible for the implementation of spectroscopic methods as a tool for the development of new ceramic materials and processing (G. Gregori, W. Burger and V. Sergo, "Piezo-Spectroscopic Analysis of the Residual Stress in zirconia-toughened alumina ceramics: The influence of the tetragonal-to-monoclinic transformation" Materials Science and Engineering, A271 401-406 (1999). Presently, the developed biomaterial, produced and marketed by CeramTec is used as ball head for hip joint prostheses for thousand of patients every year.

Since 2001 to date prof. Sergo has been a regular consultant for the french aereospace industry SNECMA (France), regarding the use of photostimulated luminescence spetroscopy as a technique for the characterization and life time prediction of zirconia ceramic thermal barrier coatings. The result of a collaboration on this subject among universities and industries both in Europe and USA has led to a “Round Robin” test. (J.A. Nychka, D.R. Clarke, E. Jordan, M. Gell, M.J. Lance, S.r.j. Saunders, I.M. Smith, C.H. Chunnial, **V. Sergo**, R. Pillan, A. Atkinson, A. Selcuk, K.s. Murphy, "NDE assessment of TBCs: an interim report of a photo-stimulated luminescence 'round robin' test" Surface and Coatings Technology, 163-164 (2003) 87-94.

Prof. Sergo has collaborated with Siemens (Munich, Germany) on projects where Luminescence and Raman spectroscopy has been used for the charaterization-production feedback on ceramic Thermal barrier coatins, on high-power ceramic lamps, and on Low Temperature Co-fired Ceramics (LTCC).

Prof. Sergo has collaborated with CESI (Milan Italy) on the realization of a portable instrument for the spectroscopic stress analysis of turbines for power generation.

He has a ongoing collaboration with Inion (Tampere, Finland) for the use of Raman spectroscopy in the study of bioglass degradation and concomitant Hydroxylapatite formation for bone reconstruction applications.

Since 2000 He has permanent collaboration with the industrial world leader in the production of presses and furnaces for the ceramic manufacturing, SACMI (Imola, Italy). The collaboration spans from the monitoring of research contracts, to the development of new materials and methods applied to tradional ceramic market (tile, sanitary ware, etc.). Prof. Sergo has been one of the first Full professors with endowed chair in Italy. Specifically, the chair of prof. Sergo has been endowed by SACMI (www. Sacmi.it).

He is member of the administrative board, upon indication of the University Senate, of the first and most succeful spin-off of the university of Trieste, Genefinity ltd. The spin-off, founded in 2006, has now close to 20 employees. Genefinity has been received twice by the president of the Republic of Italy, G. Napolitano and, presently, is developing projects for, among other, BMW and Coca Cola. (www.genefinity.com)

Scientific awards

In 1993 Prof. Sergo has been awarded a NATO-National Research Council fellowship for studies on spectroscopic methods applied to ceramics.

In 1996 he has been the recipient (ex aequo) of the best publication award from the Japanese Ceramic Society for a contribution on nanostructured ceramic composites (collaboration with Toray Industries, Japan, and Kyoto Institute of Technology, Japan). G. Pezzotti, V. Sergo, K Ota, O. Sbaizero, N. Muraki, T. Nishida and M. Sakai, "Residual Stresses and *Apparent* Strengthening in Ceramic-Matrix Nanocomposites," Journal Japanese Ceramic Society, 104 <6> 497-503 (1996).

In 2005 he has been the recipient (ex aequo) of the award for the best contribution to the Congress of European Societies for Biomaterials with a work concerning the spectroscopic characterization of the biodegradation of glasses in simulated body fluids (collaboration with Inion Inc. Finland). (L. Moimas, G. De Rosa, V. Sergo, C. Schmid, ""Bioactive porous scaffolds for tissue engineering applications: investigation on the degradation process by Raman spectroscopy and scanning electron microscopy" Journal of Applied Biomaterials & Biomechanics 2006; Vol. 4 no. 2: 102-109)

In 2009 he has been the recipient (ex aequo) of the award for the best contribution to the XIII European Conference on the Spectroscopy of Biological Molecules" with a work concerning "Chemical imaging of articular cartilage with Raman mapping" "Chemical imaging of articular cartilage sections with Raman mapping, employing uni- and multi-variate methods for data analysis", ANALYST, pp. 3193- 3294, Vol. 135

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63) J.A. Nychka, D.R. Clarke, E. Jordan, M. Gell, M.J. Lance, S.r.j. Saunders, I.M. Smith, C.H. Chunnial, **V. Sergo**, R. Pillan, A. Atkinson, A. Selcuk, K.s. Murphy, "NDE assessment

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64) H. Tomaszewski, J. Strzeszewski L. Adamowicz and **V. Sergo**, "Indirect Determination of the Piezo-Spectroscopic Coefficients of Ceria-Stabilized Tetragonal Zirconia Polycrystals" J. Am. Ceram. Soc., 85 (11) 2855-57 (2002).

65) J.Kaspar, P.Fornasiero, G.Balducci, R.Di Monte, N.Hickey, and **V.Sergo**, "Effect of ZrO_2 content on textural and structural properties of CeO_2-ZrO_2 solid solutions made by citrate complexation route" Inorganica Chimica Acta, 349, 217 – 226, (2003).

66) A. Piras, S. Colussi, A. Trovarelli, **V. Sergo**, J. Llorca, R. Psaro and L. Sordelli, "Structural and morphological investigation of ceria-promoted Al2O3 support under severe reducing/oxidizing conditions," J.Phys.Chem., *B*, *109,* 11110-11118 (2005).

67) **V. Sergo**, "Room temperature aging of Laminate Composites of Alumina/3-mol%-Yttria-Stabilized Tetragonal Zirconia Polycrystals," J. Am. Ceram. Soc., 87 (2) 247-53 (2004).

68) A. Rainer, S. Roitti and **V. Sergo** "Catalytic properties of Ceramic Foams" Key Engineering Materials, 264-268 (III), 2219-2222 (2004).

69) P. Fornasiero, A. Speghini, R. DiMonte, M. Bettinelli, J. Kaspar, A. Bigotto, **V. Sergo** and M. Graziani, "Laser excited luminescence of trivalent lanthanide impurities and local structure in CeO2-ZrO2 mixed oxides", Chemistry of Materials, 16 (10), 1938-1944 (2004).

70) R. Abbasova, S. Visintin and **V. Sergo**, "Piezo-Spectroscopic Behavior of the emission bands of a-alumina in the 13900-14250 cm^{-1} spectral range," J.Mater. Science, 40 (7) 1593-97 (2005).

71) N. Scuor, E. Lucchini, S. Maschio, S. Lo Casto and **V. Sergo**, "Wear Mechanisms and residual stresses in alumina-based laminated cutting tools," Wear, 258 (9) 1372-1378 (2005).

72) S. Lo Casto, E. Lucchini, O. Sbaizero, **V. Sergo**, N. Scuor, M. Nicolich, "Characterization of Diamond-like coatings on Hard metal cutting tools via Raman Spectroscopy and Piezo-spectroscopy," pp. 375-383, Proceedings of the 5th International conference "THE Coatings", Kallithea of Chalkidiki, Greece, 5-7 october 2005 (Eds. K.D. Bouzakis, B. Denkena, M. Geiger, H.K. Toenshoff).

73) L. Moimas, G. De Rosa**, V. Sergo**, C. Schmid, ""Bioactive porous scaffolds for tissue engineering applications: investigation on the degradation process by Raman spectroscopy and scanning electron microscopy" Journal of Applied Biomaterials & Biomechanics 2006; Vol. 4 no. 2: 102-109

73) N. Scuor, P. Gallina, H.V. Panchawagh, R.L. Mahajan, O. Sbaizero, **V. Sergo**, "Design of a novel MEMS platform for the biaxial stimulation of living cells," Biomed. Microdevices, 8, 239-246 (2006).

74) L.De Maria*, C.Rinaldi, A.Martinelli and **V. Sergo**, "Non-destructive Integrity Assessment studies of TBC coatings" proceedings of TURBINE FORUM 2006 aprile 26-28 – NIZZA.

75) L. De Maria, C. Rinaldi, P. Lupetin and **V. Sergo**, "Portable optical system for in-situ thermal barrier assessment of service operated blades" Proceedings of ASME TURBO Conference 8-11 maggio, 2006 BARCELLONA

77) MASCHIO S, ANEGGI E, TROVARELLI A, SERGO V. (2008). Influence of erbia or europia doping on crystal structure and microsctructure of ceria-zirconia (CZ) solid solutions. CERAMICS INTERNATIONAL. vol. 34, pp. 1327-1333 ISSN: 0272-8842. doi:10.1016/j.ceramint.2007.03.006.

78) C. Krafft and **V. Sergo**, "Biomedical applications of Raman and infrared spectroscopy to diagnose tissue", Spectrosc. Int. J. vol 20(5-6), 195-218 (2006)

79) KRAFFT C, CODRICH D, PELIZZO G, SERGO V. (2008). Raman and FTIR imaging of lung tissue: methodology for control samples. VIBRATIONAL SPECTROSCOPY. vol. 46, pp. 141-149 ISSN: 0924-2031. doi:10.1016/j.vibspec.2007.12.007..

80) KRAFFT C, CODRICH D, PELIZZO G, SERGO V. (2008). Raman and FTIR Imaging of lung tissue: congenital cystic adenomatoid malformation. ANALYST. vol. 133, pp. 361-371 ISSN: 0003-2654. doi:10.1039/B712958K.

81) KRAFFT C, CODRICH D, PELIZZO G, SERGO V. (2008). Raman and FTIR microscopic imaging of colon tissue: a comparative study. JOURNAL OF BIOPHOTONICS. vol. 1, pp. 154-169 ISSN: 1864-063X. doi:10.1002/jbio.200710005.

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