

## SUSAN MANALASTAS GALLARDO

### Present Position/Affiliation

Fellow/Retired Professor, CHEMICAL ENGINEERING DEPARTMENT  
De la Salle University (DLSU), Manila, Philippines  
Consultant, CESDR De la Salle University  
Consultant, AECOM (for the World Bank funded project on Inventory of POPs  
Contaminated Sites in the Philippines)

### Educational Background

B.S.Ch.E./ U.S.T./ 1976  
M.S.En.E./U.P. Diliman/1982  
Doctor of Engineering/ Tokyo Institute of Technology,  
Japan/1998  
Post Doctoral/University of California-Riverside/Jan-June 2006

### Special Training/Fellowship

HRAR Design and Development/ KMITT, Thailand/ May11-  
June 6, 1987  
JSPS Exchange Scientist/ Tokyo Institute of Technology/ Oct. 15-  
Nov. 23, 1990  
JSPS RONPAKU Research Fellow/Tokyo Institute of Technology/  
JFY 1993-97(5 years)  
DLSU Teaching Methodology Improvement(Modules 1 to 5)/CREM-  
DLSU/2000-2003  
Fulbright Advanced Research Fellow on Surface Chemistry/Univ. of California-  
Riverside/Jan- June 2006  
Research Fellow/Visiting Professor/Department of Geo and Material Science, University of Paris-  
EST/May 1-June 30, 2013

### Project Management

ARRPET DLSU National Research Institute Representative /Director, 2001-2008  
Asia Sweddish Research Partnership Program Leader , 2004-2006  
SDCC/AIT-France Network Representative, 2012-2014  
UNIDO National Project Coordinator, Enabling Activity to Review and Update the NIP of the SC  
on POPs in the Philippines  
JICA AUNSEED Net collaborative research projects leader, 2004-present

### Researches Completed

1. Comparative Study on Biogas Production from Agricultural Wastes/DLSU-URC/1981-82
2. Anaerobic Digestion of Sludge/DLSU-URC/1982-83
3. Utilization of Soapstock in White Laundry Soap Production/DLSU-  
URC/1983-84
4. Biomass Converison I & II/DLSU-URC/1984-85-86
5. Effect of Filter Media on the Efficiency of Anaerobic Upflow Filter/DLSU-URC/1986-87
6. HRAR Technology I/DLSU-URC/1987-88
7. Biofilm Development in HRAR /DLSU-URC/1988-89
8. CO<sub>2</sub> Fixation Using an Algae Pond/DLSU-URCO/1989-90
9. A Study on the CO, HC and NO<sub>x</sub> Emission from Different Motor  
Vehicles in Metromanila/DLSU-URCO, SF/1992-93
10. A Kinetic Study on CO Oxidation with O<sub>2</sub> on Alumina/NIIYAMA –  
TIT, JSPS/1993-94
11. Isotopic Tracer Study on CO Oxidation on Alumina/NIIYAMA-  
TIT, JSPS/1994-95
12. Effect of Carbon Deposition During CO Oxidation on

- Alumina/NIIYAMA-TIT, JSPS/1995-96
13. Oxidation Activity of Alumina for CO and some HC's/DLSU-URCO, SF/1993-94
  14. Methanol Oxidation on Alumina/NIIYAMA-TIT, JSPS/1996-97
  15. A Study on the Promotion & Deactivation of Alumina During CO Oxidation and Propylene Oxidation/DLSU-URCO, SF/1996-97
  16. Surface Characterization of Alumina & Ceria-Alumina Using TPD and FTIR/NIIYAMA-TIT, JSPS/1997-98
  17. Rain Quality Monitoring in Metro Manila/URCO-SF/1999-2000
  18. Acid Deposition Study Using Filter Pack Method in Taft Avenue, DLSU/CHE-COE, CHED/2000-2001
  19. Carbon Dioxide Reforming of Methane: Effect of Support Materials on the Activity of the Catalysts/CHED/2001-2002
  20. Utilization of Activated Carbon for VOC Adsorption/URCO-CHED-CRF/2001-2002
  21. Alternative Treatment of VOC Utilizing Activated Carbon/URCO-DLSU/2002-2003
  22. Treatment of PCBs Using Advanced Oxidation Processes/ARRPET/2001-2003
  23. Characterization of Sludge from Recycling Paper Mill in the Philippines/ARRPET/2001-2002
  24. Assessment of PCBs Management in the Philippines/Research Faculty Grant & ARRPET/2001-2002
  25. Assessment of Discharges from Pulp & Paper Industries of the Philippines/Research Faculty Grant/2002-2003
  26. Characterization of Sludge from a Recycled Paper Mill in the Philippines/ARRPET/2003
  27. Alternative Sludge Management in a Recycled Paper Mill in the Philippines: Focus on Composting/Research Faculty Grant/2003-2004
  28. Windrow Composting of Sludge from Recycled Paper Mill in the Philippines: Effect of C:N Ratio/ARRPET/2004
  29. Development of Appropriate Management and Treatment of Polychlorinated Biphenyls in the Philippines/ARRPET Phase I-SIDA/2001-2004
  30. Alternative Sludge Management of Recycled Paper Mills in the Philippines/ARRPET Phase II-SIDA/2001-2004
  31. Activity of Metal Oxide Supported on Activated Carbon during the Oxidation of Volatile Organic Compound/URCO-DLSU/2003-2004
  32. POPs Inventory in the Philippines/UNDP-EMB Enabling Activity for the Stockholm Convention/Project Leader/2002-2003
  33. Photodegradation & Biodegradation of Common Persistent Organic Compounds: Focus on Chlordane/Research Faculty Grant/2004-2005
  34. Development of Low Temperature Catalysts for Steam Reforming of Methane Part I: Catalysts Preparation and Surface Characterization/JICA/2003-2005
  35. Adsorption & Reactivity of Common Volatile Organic Compounds on Metal Oxides Supported on Activated Carbon/Fulbright Advanced Research Program/2005-2006/Fulbright Visiting Researcher to University of California-Riverside
  36. Adsorption of VOCs on Pretreated Activated Carbon/URCO/2005-2006/Sabbatical Research
  37. Kinetics & Mechanism of PCB 153 Using UV Peroxidation/Tokyo Institute of Tech & De la Salle University Collaboration in Chemical Engineering/2005-2006
  38. Low Temperature Steam Reforming of Methane using Ni supported on Various Support Materials/JICA AUNSEED Net Collaborative Research on Catalysis/2003-2005
  39. Effect of Ni Loading on the Catalytic Activity of Ni/ZrO during low temperature Steam Reforming of Methane/JICA AUNSEED Net Collaborative Research on Catalysis/2005-2006
  40. Effect of Type of ZrO and CeO on the Activity of Ni/ZrO during Low Temperature Steam Reforming of Methane/JICA AUNSEED Net Collaborative Research on Catalysis/2005-2007
  41. Effect of Calcination Temperature on the Activity of Ni/ZrO during Low Temperature Steam Reforming of Methane/JICA AUNSEED Net Collaborative Research on Catalysis/2007-2008
  42. Development of Sequential Photo-oxidation & Biofilm Reactor Technology for the Treatment of Persistent Organic Compounds/ARRPET Phase II-SIDA/2004-2007/Phil NRI Representative & Program Leader
  43. Development of Windrow Composting for Recycled Paper Mill Sludge/ARRPET Phase II-SIDA/2004-2007/Phil NRI Representative & Program Leader

- 44..Application of UV and Zero-valent iron for endosulfan treatment in water/Asian Regional Program on Persistent Organic Pollutants/2007-2008/Project leader
- 45.. Initial Inventory of New Industrial POPs/UNIDO Project/Nov. 2009/New POPs Expert
- 46.. Photocatalysis for Color Removal of Dyes from Textile Industries/May 2009-2011/Program Leader/DOST-PCIERD-ERDT
47. Development of Personal Water Purifier for Poor Communities in the Philippines-Preparatory Grant Phase/Dec 2009-2010 /Collaboration with Manhattan College, N.Y.
48. Facilitated Biological Treatment of Persistent Organic Compounds/Asia Swedish Research Partnership Program-SIDA/2004-2009/Project Leader
49. Utilization of Natural Gas Using Catalysis/AUNSEED-JICA/2002-2010/Co-proponent
50. Photocatalytic Degradation of Volatile Organic Compounds in the Printing Industry Phase 2/AUNSEED Net –JICA/2007-2011/Main Proponent
51. Assessment of Nasty Nines in the Philippines/2010-2011/EMB-POPs Management Office
52. Photocatalytic removal of dyes from Textile Industry/ERDT-DOST/2008-2011/Program Leader
53. Photocatalytic degradation of Lignin from Recycled paper mill wastewater/2009-2011/ARRPET-DLSU
54. Novel Natural Water filters for Nagcarlan, Philippines/NCIIA & USEPA P3/2009-2011/Co-Proponent
55. The Effect of Surface Modification of Coconut-Shell Based Activated Carbon on Methomyl Adsorption/2010-2011/ ERDT project
56. Biodegradation of Endosulfan in soil by Fungal soil isolate/DOST-ERDT/2009-2010
57. Adsorption of Common VOCs on Pretreated ACs and Metal Oxide supported on AC/2011/URCO-SF
58. Photocatalytic Technology for the Printing Industry's Environmental Concern/2007-2011/JICA AUNSEED Net CR
59. Sustainability Issues due to Coal Ash from Coal Fired Power Plants in the Philippines Phase I: Impact assessment on coal ash dumping in a Typical Power Generating Facility/2011-2012/URCO-IR
60. Structural Stability of Ferrocement used in Garbage Barges/2011-2012/ URCO-IR
61. Durability of Ferrocement Garbage Disposal Barge/2011-2012/URCO-IR
62. Sustainability Issue due to Caol Ash from Coal fired Power Plants in the Philippines Phase 2: Sustainable solutions for an Industry Partner/2012-2013/URCO-IR
63. National Inventory of New Persistent Organic Pollutants/UNIDO-EMB/2012-2014
64. Developing Sustainable solutions to environmental Problems Associated with Coal Fired Power Plants in the ASEAN region/2013-2014/URCO-RPW
65. A Solar-Powered, Sustainable, Hybrid Electrodialysis/Reverse Osmosis Desalination System for Rural Areas of Developing Countries/USEPA P3 with Manhattan College/2012-2013

#### **Patent Applications**

1. A Biodegradable filter using coconut derived activated carbon and citricidal/June 2012/submitted the DLSU IPO
2. Photocatalytic treatment of colored wastewater/March 2011/ submitted to TAPI-DOST

#### **On-going Research Projects & Programmes**

1. Extraction of antimicrobial from Calamansi seeds and peelings for E. Coli removal/2013-2015/JICA AUNSEED Net CR
2. Non thermal plasma destruction of VOCs/2013-2016/JICA AUNSEED Net CR
3. Development of catalysts for NTP destruction of benzene/2015-2016/ERDT
4. Development of Zeolite from corncobs as an additive to pervious concrete for a desalination system/2015-2016/CHED
5. Utilization of coal ash and RHA for geomaterial as insulating material/JICA/AUNSEED net CRC/2014-2016
6. Bioleaching of trace metals from coal ash/2014-2016/ERDT, JICAAUNSEED net CRC, UPE
7. Development of sustainable solutions to Coal ash management in the Asisan region/2014-2016/JICA AUNSEED net CRC

#### **PUBLICATIONS IN INTERNATIONAL REFEREED JOURNALS**

- (1) S. Gallardo, E. van Hullebusch, D. Pangayao, M.B. Salido & R. Ronquillo, "Chemical, leaching and toxicity characteristics of coal ashes from Circulating Fluidized Bed of a Philippine coal-fired power plant", *Water, Air and Soil Pollution* (August 2015)
- (2) J. C. Gallo, M. B. Mariano, A. D. Lucanas, M. B. Ko, J. Q. Borja, H. Hinode, S. M. Gallardo, **Photocatalytic degradation of turquoise blue dye using immobilized AC/TiO<sub>2</sub>: Optimization of process parameters and pilot plant investigation**, *Journal of Science & Technology*, July, 2015
- (3) D. C. Pangayao, E. D. van Hullebusch, S. M. Gallardo, F. T. Bacani, **Bioremediation of trace metals from coal ash using mixed culture of *Acidithiobacillus albertensis* and *Acidithiobacillus thiooxidans***, January 2015
- (4) J.P. Abulencia, S. O'Brien, S. Gallardo, and F.N. Tanala, "A Sustainable Water Purification Solution for Rural Communities", *International Journal of Environmental Pollution and Remediation*, 1:75-81, (2013)
- (5) J.P. Abulencia, N. Abraham, A. Caracio, F. Tanala & Susan Gallardo, "Sustainability of water resources for the poor", *Conscience-Journal of Sustainable Development*, Issue 4 (2010)
- (6) C.Arboleda, L. Abella, S. Gallardo, "Effect of Light Intensity on the Photodegradation of PCB 153 in Aqueous Solution using UV and UV/H<sub>2</sub>O<sub>2</sub>", *JWET*, Vol. 9, No. 1 (March 2011)
- (7) D. Yu, C. Arboleda, L. Abella, S. Gallardo, "Degradation of PCBs in Aqueous solutions after UV-peroxide treatment: Focus on Toxicity of Effluent to Primary Producers", *Ecotoxicology and Environmental Safety* on April 15, 2011.
- (8) T. Monroy, L. Abella, S. Gallardo, C. Salem, "Catalytic Dry Reforming of Methane using Ni/MgO-ZrO<sub>2</sub> Catalyst", *Book of proceeding -2<sup>nd</sup> Annual Gas Processing Symposium, Qatar, Jan. 12-14, 2010*(Elsevier)
- (9) A. Purnomo, L. Abella, S. Gallardo, C. Salem, H. Hinode, "Comparison of the Catalytic Performance of Ni/CeO<sub>2</sub>/ZrO<sub>2</sub> and Commercial Catalyst during Steam Reforming of Methane", *Asean Journal of Chemical Engineering*, Vol 8, No. 1, 2008
- (10) A. Purnomo, L. Abella, C. Salem, H. Hinode, "Effect of Ceria Loading on the Carbon Formation during Low Temperature Methane Steam Reforming over a Ni/CeO<sub>2</sub>/ZrO<sub>2</sub> Catalyst"/ *Reaction Kinetics & Catalysis Letters*, Vol 95 No. 2, Dec. 2008
- (11) C.Arboleda, L. Abella, "Determination of Light Intensity using Potassium Ferrioxalate chemical actinometry for Photodegradation of PCB 2, 2', 4,4', 5,5' Hexachlorobiphenyl", *Journal of Science & Technology*, Vol 2, No. 1, Oct. 2007
- (12) T.H. Nguyen, N. Bunsu, J. Borja, S. Gallardo, P. Ngaokanwivat, H. Hinode, "Preparation & Characterization of Nano-titania/activated carbon composite by sol-gel method-Effect of AC loading on surface properties and adsorption of toluene"/ *Journal of Science & Technology*, Vol 47, No. 5A, 2009
- (13) Anton Purnomo, Susan Gallardo, Leonila Abella, chris Salem, Hirofumi Hinode, "Effect of Ceria Loading on the Carbon Formation during Low Temperature Methane Steam Reforming over a Ni/CeO<sub>2</sub>/ZrO<sub>2</sub> Catalyst", *Reaction Kinetics & Catalysis Letter*, Vol 95, NO. 2, Dec. 2008
- (14) Nguyen Quang Long, Leonila Abella, Susan Gallardo, Hirofumi Hinode, 2008. The Effect of Nickel Loading on Catalytic Activity of Ni/ZrO<sub>2</sub> for Steam Reforming of Methane at Low Temperature/Reaction Kinetics & Catalysis Letters, Vol.93
- (15) Gerly Moradas, Joseph Auresenia, Susan Gallardo, Benoit Guieysse, 2008, Biodegradability & Toxicity of Trans Chlordane Photochemical Treatment, *Chemosphere*
- (16) Borja, J., Auresenia, J. and Gallardo, S. 2006. Biodegradation of Polychlorinated Biphenyls Using Biofilm Grown with Biphenyl as Carbon Source in Fluidized Bed Reactor. *Chemosphere* 64
- (17) Borja, J., Auresenia, J. and Gallardo, S. 2006. Kinetics of Polychlorinated Biphenyls Biodegradation Using Biofilm Grown on Biphenyl. *ASEAN Journal of Chemical Engineering*,
- (18) Centeno, C., Abella, L. and Gallardo, S. 2005 Degradation of PCBs in Water Matrix Using UV/H<sub>2</sub>O<sub>2</sub>. Accepted for publication to the *Journal of Water and Environmental Technology of Japan Society of Water Environment* (an e-journal), Vol 1, No. 3
- (19) Centeno, C., Estrellan., C., Maridable, J., Abella, L. and Gallardo, S. 2006. Degradation of PCBs in Water Matrix Using UV/H<sub>2</sub>O<sub>2</sub>: Effect of Initial PCB Concentration and Analysis of Reaction Products. Accepted for publication in *ASEAN Journal of Chemical Engineering*. In Press.
- (20) Borja, J., Taleon, D., Auresenia, J., and Gallardo, S. 2005. Polychlorinated Biphenyls and Their Biodegradation, *Process Biochemistry*, 40, 1999-2013
- (21) Centeno, C., Abella, L., & Gallardo, S., 2005, "Degradation of PCBs in Water Matrix Using UV/H<sub>2</sub>O<sub>2</sub>:Effect of Oxidant Concentration & pH", *Journal of Research in Science, Computing & Engineering*, Vol 2 No. 2
- (22) Carillo, L. & Gallardo, S., 2005, "Heavy Metals Characterization of Sludge from a Recycled Paper Mill in the Philippines", *Asean Journal of Chemical Engineering*, Vol. 4, No 2

- (23) Benjamin, M., Centeno, C, Abella, L., & Gallardo, S., 2004, "A Review On The Dechlorination & Degradation Of Chlorinated Organic Compounds Using Advanced Oxidation Processes", Journal of Research in Science & Technology, Vol 1, No. 2
- (24) Gallardo, S., 2003, "Air Pollution Studies in MM and Catalysis Technology for Clean Air Philippines", Pure And Applied Geophysics, 160; 325-339
- (25) Centeno, C., Abella, L., & Gallardo, S., 2002, "Alternative Technology Options For The Chemical Treatment Of Polychlorinated Biphenyls", INHENYERIYA, VOL 2, NO. 3
- (26) Abella, L. & Gallardo, S., 2001, "The Challenges & Opportunities Of Environmental Catalysis In The Natural Gas-Based Industry And In Academe", INHENYERIYA, VOL 2 No. 1
- (27) Gallardo, S., Aida, T. & Niiyama, H., 2000, "Field Performance of Ceria-Alumina Catalysts For Automotive Exhaust Treatment In Metro Manila", Inhenyeriya: An International Journal , Vol 1 No. 2
- (28) Gallardo, S., Aida, T., & Niiyama, H. , 1998, "Development of Base Metal Oxide Catalyst for Automotive Emission Control", Korean Journal Chemical Engineering, vol.15 p.480
- (29) Gallardo, S., Aida T. & Niiyama, H., 1997, "In-Situ Active Site Formation in CO Oxidation on Alumina", Research on Chemical Intermediates, vol.24 p.401

#### **PUBLICATIONS IN NATIONAL REFEREED JOURNALS**

- (1) J.Gallo, J. Naraval & S. Gallardo, 2011, Bench-Scale composting of recycled paper mill sludge using chicken manure + duck manure, kitchen wastes and agricultural wastes as nitrogen amendments, Philippine Agricultural Scientist, Vol.94, No. 3, Sept. 2011
- (2) S. Gallardo, A. Villaluz, R. Abalos, A. Chua, "Activity of Metal Oxides on Activated Carbon during Xylene Oxidation", Journal of Research in Science, Computing and Engineering, 4(2), 45-54 (2007)
- (3) Centeno, C., Abella, L. and Gallardo, S. 2004, Application of Selected Advanced Oxidation Processes for the Degradation of PCBs in Oil and Water Matrices, Philippine Institute of Chemical Engineers Journal, Vol 7, No.1
- (4) Gallardo, S., Gallo, J., Pabayo, V. and Limcuando, V. ARRPET-DLSU Survey in Sludge Management of the Pulp & Paper Industry in then Philippines. Accepted for publication to Technical Association of the Pulp and Paper Industries in the Philippines Newsletter
- (5) Gallardo, S. & Niiyama, H., 1997 "Kinetic Study Using Differential Reactor Approximation: CO Oxidation with Oxygen on Alumina", DLSU Engineering Journal vol.11 p.57
- (6) Gallardo, S., 1994, "The Influence of CO<sub>2</sub> Concentration on CO<sub>2</sub> Removal & Algal Growth in an Algae Pond", DLSU Engineering Journal vol. X
- (7) Gallardo, S. 1993, "Air Pollution Study in Metro Manila", DLSU Engineering Journal
- (8) Gallardo, S., 1990, "Preliminary Investigation on the Performance of Anaerobic Fixed Film Reactor", DLSU Engineering Journal
- (9) Gallardo, S. & Gagelonia, A., 1989, "Comparative Study on the Efficiency of the Anaerobic Upflow filter Using Different Types of Filter Media", DLSU Engineering Journal
- (10) Gallardo, S. , 1988, "Comparative Study in Biogas Production from Agricultural Wastes", AGHAM
- (11) Gallardo, S., 1987, "Biomass Conversion", UPDATE
- (12) Gallardo, S., 1987, "Preliminary Investigation on Ethyl Alcohol Production from Whey through Anaerobic Fermentation", DLSU Engineering Journal
- (13) Gallardo, S., 1987, "Utilization of Soapstock in White Laundry Soap Production", DLSU Engineering Journal

#### **PhD Mentoring**

1. Carmela Centeno, " Degradation of Polychlorinated Biphenyls using UV/H<sub>2</sub>O<sub>2</sub>", 2004
2. Josephine Borja, "Application of Biofilm Technology in the Degadation of PCBs" ; 2006.
3. Anton Purnomo, 'Development of Ni-CeO<sub>2</sub>/ZrO<sub>2</sub> Catalyst for Low Temperature Steam Methane Reforming', 2010
4. Trung Hieu Nguyen, Photocatalytic Destruction of Monochlotobenzene using Nano TiO<sub>2</sub>/AC (2012)
5. Jurex Gallo, Development of a Photocatalytic Reactor with Immobilized AC/TiO<sub>2</sub> for Turquoise Blue Removal, 2014

6. Victor Nguyen, "Evaluation of the Engineering and Physicochemical Properties of a Novel Geopolymer Binder from Red Mud, Rice husk ash, and Diatomaceous earth using Sodium Silicate Solution as Alkaline Activator", 2015
7. Denver Pangayao, Biobleaching of Trace Metals from Coal Ash Using Microbial isolate from Coal Ash Pond, 2016
8. Norway Pangan, "Development of an Electrodialysis Desalination System using corn cob ash zeolite-concrete membranes", 2016
9. Martin Kalaw, "Development of Coal-Ash Composites for Insulation Materials and Fire Protection", 2016
10. Myo Myint Zaw, "Destruction of xylene using manganese and cerium oxides supported on alumina catalyst in non-thermal plasma catalysis system", 2016

#### **Awards Received**

- Outstanding Faculty Member/College of Engineering,U.S.T./1978-79
- Gold Medal (Research Fellow)/Japan Society for the Promotion of Science/1998
- 3<sup>rd</sup> Placer/Regional S & T Fora & Competitions/PCIERD/Jan. 2000
- 2<sup>nd</sup> Placer/National S & T Fora & Competitions/PCIERD/Mar. 2000
- St. Miguel Febres Cordero Research Award for Socially Relevant Project/DLSU/2001
- Diploma for Outstanding Contribution to Environmental Engineering/International Bibliographical Center, London/2002
- Semi-finalist – Metrobank Search for Outstanding Teachers in the Philippines/2002
- URCO Annual Recognition for Completed Projects/2000-present
- ARRPET I/ 2000-2003/ SIDA
- ARRPET II/ 2004-2007/SIDA
- ASIA SWEDISH RESEARCH PARTNERSHIP PROGRAM/2004-2006/SIDA
- PATE Golden Anniversary Award for Research & Development/November 2005
- Fulbright Visiting Researcher/ Fulbright Advanced Research Program/2005-2006
- University Fellows/DLSU/August 2006
- NAST Outstanding Scientific Paper Award/Manila Hotel/July 2007
- Centennial Award for Research/UST College of Engineering/Dec. 14, 2007
- Outstanding Chemical Engineer (R & D)/PICHE/February 2008/Cebu
- NAST Outstanding R & D Award (Julian Banzon Medal)/NAST & DOST/Manila Hotel/July 2009
- NAST Outstanding Paper Awards/NAST/Manila Hotel/July 2009
- 3<sup>rd</sup> Placer Regional S & T fora and Competition/PCIERD/DOST conference room/March 17, 2010

