Resume of Dr. P. V. Ananthapadmanabhan

Name P. V. Ananthapadmanabhan (P.V.A. Padmanabhan)
Outstanding Scientist(Rtd)
Head, Thermal Plasma Technologies Section
Laser & Plasma Technology Division
BARC, Mumbai-400 085, India
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Academic Qualifications

1. Ph.D., 1988, University of Bombay, Mumbai, India, thesis entitled 'Investigations on Materials for Magnetohydrodynamic(MHD) Generator'
2. Orientation Course at Dept. of Atomic Energy Training School, Mumbai, India, 1976-77, First class.
3. B Sc. (Chemistry) 1976, University of Calicut, Kerala, First class(80.9%), First rank in college, 3rd rank in university.
4. **Sixth DST-NIAS training for senior scientists-adminitrators 2008** 'Multidisciplinary Perspectives on Science and Technology'.

Awards/ Recognitions/Honours/ Listings

1. Homi Bhabha Science &Technology Award, 2011
2. DAE Group Achievement Award for "Indigenous development of novel plasma sprayed coating technology for containment of molten actinides', 2011
3. DAE Special Contribution Award 2007
4. Visiting Scientist, Univ. Of Idaho, Idaho, USA (1996-97)
5. Member, Technical Advisory Group of ARCI 2014 onwards(Engineered Coatings)
6. Member, Advanced Technologies Committee, BRNS
7. Marquis Who's Who in Science and Engineering 2003-04, Marquis Publishers, New Jersey, USA
8. Who's Who in the World, 1997(14th edition Marquis Publishers)
9. National Merit Scholarship of the Govt. of India 1971-76
8. Chemical Society Madhava Raja Memorial Prize, 1975-76.
9. Best student award Chemistry(Govt. Victoria College, Palghat, Kerala, India.) 1973-74.
10. Best Student Award from Rotary Club of Palghat, Kerala, 1971
11 Expert member of the panel of reviewers for various international journals including Ceramics International, Surface and Coating Technology, Materials Science, Materials Chemistry and Physics, 'VACUUM', Chemical Engineering Journal, J. of Environmental Sciences, etc.
12. Expert in the reviewers' panel of National funding agencies (DST, BRNS) and Universities

Technologies/processes developed and patents

- Development of plasma aerosol generator for experimental simulation of LOCA scenario in Nuclear reactors
- Complete process development including material synthesis, plasma spray deposition, coating evaluation for molten uranium corrosion and deployment in DAE-Defense strategic areas
- Reactive Plasma Process development for bulk synthesis of nano-crystalline materials
- Cost effective and efficient single-step plasma process for conversion of zircon to zirconia
- Thermal shock resistant Zirconia-based sintered ceramics for high temperature(>1500K) high thermal flux (~1 MW/m^2)
- Reactive plasma process to convert ilmenite to TiC, TiN
- **Indian patent on "THERMAL PLASMA TECHNOLOGY FOR PROCESSING OF ZIRCON"** P.V.Ananthapadmanabhan, S. Yugeswaran and T.K. Thiyagarajan

Patent application No.616/MUM/2013, Date of filing of Application : 01/03/2013, Patent office journal Publication Date : 03/05/2013

Research adviser

Ph.D research scholars: 6
M.Tech research scholars: 3

Professional Memberships

1. Plasma Science Society of India
2. Power Beam Society of India,
3. MRSI, India
4. Society for Materials Chemistry, India
5. Indian Ceramic Society
6. Indian Thermal Analysis Society

Career progression and Professional/Research Experience

1976-77 Orientation course Orientation Course at Dept. of Atomic Energy Training School, Mumbai, India
1977-82 Scientific officer (C) High temperature materials development programme for Magnetohydrodynamic (MHD) generator, Development pf partially destabilized zirconia for high temperature high thermal flux environments, Materials testing and evaluation of Indian Test channel UO-2
1982-87 Scientific officer (D) developmental work on Zirconia-ceria-tantala for high temperature electrode applications, ceramic materials development for D-11 Indian MHD Test Channel
1987-1993 Scientific officer (E), Development plasma reactor for materials processing, Plasma sprayed coatings

1993-1996 Scientific officer (F) Plasma processing of materials, development of plasma sprayed coatings for strategic applications and national defence programme
1996-97 Visiting Scientist, Univ. Idaho, Dept of Mining &Metallurgy, setting up of Reactive plasma process laboratory, reactive plasma synthesis of Fe-TiC cermet coatings, TiN from ilmenite
1997-98 Scientific officer (F) development of plasma sprayed coatings for strategic applications and national defence programme, Development of plasma reactor for bulk synthesis of nanomaterials, Research on plasma synthesized nano-crystalline titania for photocatalytica application.
1998-2003 Scientific officer (G): Comprehensive development of thermal plasma technology including development of plasma device, precursor material, plasma spray deposition, material processing, coating characterization, simulation & modelling, Development, testing and integration of Plasma aerosol generator with Nuclear Aerosol Test facility (NATF),
2003-2006 Scientific officer (H) and Head Plasma Spray Techonology Section: Development of novel ceramic coatings for thermal barrier and corrosion barrier applications in DAE, Lanthanum zirconate, yttrium oxide coatings development,
2006-2012 Scientific officer (H+) and Head Plasma Spray Techonology Section, Professor HBNI, and Member Secretary, Advanced Technologies Committee, BRNS: Development of innovative plasma process scheme in air plasma medium, Development of energy-efficient innovative process for one-step dissociation of zircon in air plasma medium, Development of coating and materials characterization laboratory, Development of corrosion barrier coatings for nuclear fuel processing, Promoting, facilitating and administering many high value major R&D projects in National Universities and Research Institutes
January 2012- April 2015 Outstanding Scientist, Senior Professor, HBNI, & Head, Thermal Plasma Technology Section & member Secretary, Advanced Technologies Section, BRNS (until Oct 2014): Development of air plasma torch for incineration of soft active waste and deployment of the system at RSMS, Waste Management Division, BARC, Promoting, facilitating and administering many high value major R&D projects in National Universities and Research Institutes

2012-April 2015 Apex coordinator of XII Plan project
Project management and technical coordination of XII Plan project "Components and Systems development for Lasers, Plasmas, Electron Beam Technologies" Rs 70 crores

Journal Publications and Presentations
More than 200 publications including papers presented in international and national conferences

J Publications

Total number of journal publications: 96
Publications from: 2010-2015: 40
Areas of Research Interest

- Plasma deposition and novel ceramic coatings
- Plasma conversion of minerals and industrial wastes to advanced materials
- Novel materials for high temperature applications
- Plasma synthesis of nanocrystalline ceramic materials

- Technology development and project management
- R&D management and innovation

Publications (2009-2015 till date)

1. "Formation of nano-sized yttria in a DC plasma reactor and its characterization", Vandana Chaturvedi, **P.V.Ananthapadmanabhan**, Y.Chakravarthy, A. Pragatheeswaran, Jyothi Sharma, T.Mahata, S. Bhandari, B. Raneesh, A. Nagaraj, IEEE Transactions on Plasma Science (Accepted), **DOI 10.1109/TPS.2015.2433395.**
2. "Plasma dissociation of zircon with concurrent inflight removal of silica",S. Yugeswaran**, P.V. Ananthapadmanabhan**, T.K. Thiyagarajan and K. Ramachandran, Ceramics International (Accepted), doi.org/10.1016/j.ceramint.2015.04.020
3. Plasma sprayed ceramic coatings for barrier applications against molten uranium corrosion**, P.V. Ananthapadmanabhan**, Y.Chakravarthy, T.K. Thiyagarajan, Vandana Chaturvedi, A. Pragatheeswaran, JOM (Accepted), 2015
4. "Zircon dissociation in air plasma through a low power transferred arc, plasma torch, S. Yugeswaran**, P.V. Ananthapadmanabhan**, L. Lusvarghi, Ceramics International, 41(2015), 265-273.
5. "Plasma spray deposition of yttrium oxide on graphite, coating characterization and interaction with molten uranium, Chakravarthy Y, Subhankar Bhandari, Vandana Chaturvedi, Pragatheeswaran A, Nagaraj A, Thiyagarajan T.K, P V **Ananthapadmanaban,** A K Das, Journal of the European Ceramic Society, 35(2015),787-94.
6. " Plasma spray-deposited lanthanum phosphate coatings for protection against molten uranium corrosion, Pragatheeswaran A; **P V Ananthapadmanabhan,** Chakravarthy Y; Subhankar Bhandari; Vandana Chaturvedi; Nagaraj A; Ramachandran K, Journal of Surface and Coatings Technology, 265 (2015) 166-173.
7. "Thermal plasmaspheroidizationofaluminumoxideandcharacterization of the spheroidized alumina powder", Vandana Chaturvedi, **P.V.Ananthapadmanabhann**, Y.Chakravarthy, S.Bhandari, NirupamaTiwari, A. Pragatheeswaran, A.K.Das, Ceramics International 40 (2014), 8273-8279.
8. "Plasma spray deposition and characterization of strontium zirconate coatings, A. Pragatheeswaran, **P.V. Ananthapadmanabhan**, Y. Chakravarthy, S. Bhandari, T.K. Thiyagarajan, N. Tiwari, T.K. Saha, K. Ramachandran, Ceramics International, 40 (2014), 10441-10446
9. "Thermal cycling behavior of plasma sprayed lanthanum zirconate based coatings under concurrent infiltration by a molten glass concoction", C.S. Ramachandran, Balasubramanian V, **P.V. Ananthapadmanabhan**, Ceramics Int., 39 (2013) 1413-31,
10. "On the cyclic hot corrosion behaviour of atmospheric plasma sprayed Lanthanum Zirconate based coatings in contact with a mixture of sodium sulphate and vanadate salts: A comparison with the traditional YSZ duplex and NiCrAlY coated samples, C.S.

Ramachandran, V. Balasubramanian**, P.V.Ananthapadmanabhan**, Vacuum 97 (2013), 81-95

11. “Inflight behavior of lanthanum zircontae (La2Zr2O7) particles in gas tunnel type plasma jet and its coating properties", S. Yugeswaran, A. Kobayashi, B. Selvan, **P.V**. **Ananthapadmanabhan**, Vacuum 88, (2013) 139-43.
12. “Carbothermal reduction of sillimanite in a transferred arc thermal plasma reactor ", Vijay, M., **Ananthapadmanabhan, P.V**., Ramachandran, K., Hiremath, G., Mathai, C.B., Nalini, B., Pillai, B.C., International Journal of Refractory Metals and Hard Materials 36, (2013) 174-178.
13. “Erosion of atmospheric plasma sprayed rare earth oxide coatings under air suspended corundum particles", Ramachandran, C.S., Balasubramanian, V., **Ananthapadmanabhan, P.V**., Ceramics International 39 (2013) 649-672.
14. “Thermal cycling behavior of plasma sprayed lanthanum zirconate based coatings under concurrent infiltration by a molten glass concoction", C.S. Ramachandran, Balasubramanian V, **P.V. Ananthapadmanabhan**, Ceramics Int., 39 (2013) 413-31.
15. “Photocatalytic inactivation of Gram-positive and Gram-negative bacteria by reactive plasma processed nanocrystalline TiO2 powder", Vijay, M., Ramachandran, K., **Ananthapadmanabhan, P.V**., Nalini, B., Pillai, B.C., Bondioli, F., Manivannan, A., Narendhirakannan, R.T., Current Applied Physics, 13, (2013) 510-516.
16. “Understanding the dry sliding wear behaviour of atmospheric plasma-sprayed rare earth oxide coatings", C.S. Ramachandran, V. Balasubramanian, **P.V. Ananthapadmanabhan**, V. Viswabaskaran, Materials and Design 39 (2012) 234-252.
17. “Influence of the intermixed interfacial layers on the thermal cycling behaviour of atmospheric plasma sprayed lanthanum zirconate based coatings", Ramachandran C.S, Balasubramanian V, **Ananthapadmanabhan P.V**, Viswabaskaran V, Ceramics International 38 (2012) 4081-4096.
18. “Influence of the intermixed interfacial layers on the thermal cycling behaviour of atmospheric plasma sprayed lanthanum zirconate based coatings", Ramachandran C.S, Balasubramanian V, **Ananthapadmanabhan P.V**, Viswabaskaran V, Ceramics International 38 (2012) 4081-4096.
19. “Room temperature synthesis of high temperature stable lanthanum phosphate?yttria nano composite", Sasidharan Sankar Athira N. Raj, C.K. Jyothi, K.G.K. Warrier, **P.V.A. Padmanabhan**, Materials Research Bulletin 47 (2012) 1835-1837.
20. “Initial phase hot corrosion mechanism of gas tunnel type plasma sprayed thermal barrier coatings", S. Yugeswaran, A. Kobayashi,, **P.V. Ananthapadmanabhan**, Materials Science and Engineering B,177 (2012) 536-542.
21. “Hot corrosion behaviors of gas tunnel type plasma sprayed La2Zr2O7 thermal barrier coatings, ", Yugeswaran, S., Kobayashi, A., **Ananthapadmanabhan, P.V**., Journal of the European Ceramic Society, 32 (2012) 823-834

22. “Synthesis, spheroidization and spray deposition of lanthanum zirconate using thermal plasma process", Ramachandran C.S., Balasubramanian V, **Ananthapadmanabhan P V** , Surface & Coatings Technology, 206 (2012) 3017-3035
23. “Experimental And Simulation Approach To Plasma Spray Deposition Of Yttrium Oxide", T.K. Thiyagarajan, **P.V.Ananthapadmanaban**, K.P. Sreekumar, Y. Chakravarthy, A.K. Das and L.M. Gantayet, Surface Engineering, 28 (2012) 646-56
24. "Hot corrosion behaviors of gas tunnel type plasma sprayed La2Zr2O7 thermal barrier coatings,", Yugeswaran, S., Kobayashi, A., **Ananthapadmanabhan, P.V**, Journal of the European Ceramic Society, 32 (2012) 823 - 834
25. "Transferred arc plasma processed mullite from coal ash and bauxite", S. Yugeswaran, **P.V. Ananthapadmanabhan**, Akira Kobayashi and L. Lusvarghi,, Ceramics International 37 (2011) 3437-3444.
26. "Synthesis of mullite from sillimanite dissociation through transferred arc plasma torch", S. Yugeswaran, M. Vijay, K. Suresh, **P.V. Ananthapadmanabhan** , Zoltan Karoly International Journal of Mineral Processing 99 (2011) 54-60.
27. "Synthesis of nano-ZrO2 by reactive plasma processing", Jayakumar, S., Thiyagarajan, T.K., **Ananthapadmanabhan, P.V**., Sreekumar, K.P., Perumal, K., Mishra, S.C., Su, L.T., Tok, A.I.Y, AIP Conference Proceedings, 1349(PART A) (2011) 257-58
28. "Characterization of nano-crystalline ZrO2 synthesized via reactive plasma Processing,", S. Jayakumar, **P.V. Ananthapadmanabhan**, K. Perumal, T.K. Thiyagarajan, S.C. Mishra, L.T. Su, A.I.Y. Tok and J. Guo, Materials Science and Engineering B 176 (2011) 894-899.
29. "Influence of processing variables on the formation of La2Zr2O7 in transferred", S. Yugeswaran, Akira Kobayashi, **P.V. Ananthapadmanabhan**, Current Applied Physics, 11 (2011) 1394-1400.
30. "Multi Objective Optimization Of Atmospheric Plasma Spray Process Parameters To Deposit Yttria Stabilized Zirconia Coatings Using Response Surface Methodology", C. S. Ramachandran, V. Balasubramanian and **P. V. Ananthapadmanabhan**,Journal of Thermal Spray Technology, 20, (2011) 590-607.
31. "On resultant properties of atmospheric plasma sprayed yttria stabilised zirconia coating deposits: designed experimental and characterisation analysis", C. S. Ramachandran, V. Balasubramanian and **P. V. Ananthapadmanabhan**, Surface Engineering, 27 (2011) 217-29.
32. "Liquid uranium corrosion studies of protective yttria coatings on tantalum substrate", Nagaraj Alangi, Jaya Mukherjee, P. Anupama, M.K. Verma , Y. Chakravarthy , **P.V.A. Padmanabhan** , Journal of Nuclear Materials, 410 (2011) 39-45.
33. "In-Flight Formation of Nano-Crystalline Titanium Dioxide Powder in a Plasma Jet and Its Characterization,", **P. V. Ananthapadmanabhan**, M. Vijay, T. K. Thiyagarajan, K. P. Sreekumar, V. Selvarajan, Jiaguo Yu, Shengwei Liu, Plasma Science and Technology, 12 (2010) 426

34. "In-Flight Formation of Nano-Crystalline Titanium Dioxide Powder in a Plasma Jet and Its Characterization,", **P. V. Ananthapadmanabhan**, M. Vijay, T. K. Thiyagarajan, K. P. Sreekumar, V. Selvarajan, Jiaguo Yu, Shengwei Liu, Plasma Science and Technology, 12 (2010) 426.
35. "Development, characterization and erosion wear response of plasma sprayed fly ash-aluminum coatings ", Sahu, S.P., Satapathy, A., Patnaik, A., Sreekumar, K.P., **Ananthapadmanabhan, P.V**., Materials and Design 31, (2010) 1165-1173.
36. "Inflight dissociation of zircon in air plasma", S Yugeswaran, V Selvarajan, **P.V. Ananthapadmanabhan** and Jabardhanan Nair,IOP Publishing, Journal of Physics, Conference Series 208 (2010) 012122
37. "Twin step synthesis of lanthanum zirconate through transferred arc plasma processing", S Yugeswaran, V Selvarajan, **P V Ananthapadmanabhan** and L Lusvarghi, IOP Publishing, Journal of Physics, Conference Series 208 (2010) 012119.
38. "Bactericidal effects of Reactive thermal plasma synthesized titanium dioxide photocatalysts", M. Vijay, V.Selvarajan, **P.V. Ananthapadmanabhan**, K.P.Sreekumar, Vaclav Stengl and. Federica Bondioli, IOP Publishing, Journal of Physics, Conference Series 208 (2010) 012143.
39. "Development of Ca-doped LaCrO3 feed material and its plasma coating for SOFC applications", R.D.Purohit, Sathi.R.Nair, Deepak Prakash, P.K.Sinha and B. P. Sharma K.P.Sreekumar, **P.V.Ananthapadmanabhan**, A.K.Das and L.M.Gantayet ,IOP Publishing, Journal of Physics, Conference Series 208 (2010) 012125.
40. "Reactive plasma synthesis of nanocrystalline ceramic oxides", K.P. Sreekumar, M. Vijay, T.K. Thiyagarajan, K. Krishnan and **P.V.Ananthapadmanabhan**, IOP Publishing, Journal of Physics, Conference Series 208 (2010) 012123.
41. "Studies on the preparation and plasma spheroidization of yttrium aluminosilicate glass microspheres for their potential application in liver brachytherapy", K.P. Sreekumar, S.K. Saxena, Yogendra Kumar, T.K. Thiyagarajan, Ashutosh Dash, **P.V.Ananthapadmanabhan** and Meera Venkatesh, IOP Publishing, Journal of Physics, Conference Series 208 (2010) 012117.
42. "Neural Network Analysis for Erosion Wear of Nickel-Aluminide Coatings on Steel by Plasma Spraying", S.C.Mishra, M.Chaithanya, Alok Satapathy, **P.V.Ananthapadmanabhan** and K.P.Sreekumar, IOP Publishing, Journal of Physics, Conference Series 208 (2010) 012112.
43. "Modelling of non-transferred arogn-nitrogen plasma arc and plasma jet", B. Selvan, K.Ramachandran, K.P.Sreekumar, T.K.Thiyagarajan and **P.V. Ananthapadmanabhan**, IOP Publishing, Journal of Physics, Conference Series 208 (2010) 012047.
44. "Thermal stability studies of plasma sprayed yttrium oxide coatings deposited on pure tantalum substrate", Nagaraj A., Anupama P., Jaya Mukherjee, K.P.Sreekumar, R.U. Satpute, **P.V.Ananthapadmanabhan** and L.M.Gantayet, IOP Publishing, Journal of Physics, Conference Series 208 (2010) 012124.

45. "Simulation Studies to Optimize the Process of Plasma Spray Deposition of Yttrium Oxide", T.K.Thiyagarajan, K.P.Sreekumar**, P.V.Ananthapadmanabhan**, V.Selvan and K.Ramachandran, IOP Publishing, Journal of Physics, Conference Series 208 (2010) 012116.
46. "Influence of critical plasma spraying parameter (CPSP) on plasma sprayed Alumina-Titania composite coatings", S. Yugeswaran V. Selvarajan M. Vijay , **P.V. Ananthapadmanabhan**, K.P. Sreekumar , Ceramics International, 36 (2010),141-49.
47. "Investigation on Composite Coating of Low Grade Minerals ", S.C.Mishra, Satyabati Das, Alok Satapathy, S.Sarkar, **P.V.Ananthapadmanabhan**, K.P.Sreekumar, Journal of Reinforced Plastics and Composites, Vol.28, (2009), 3061-67.
48. "Erosion Wear Analysis of Plasma Sprayed Ceramic Coating Using the Taguchi Technique", S. C. Mishra, Satyabati Das, Alok Satapathy**, P. V. Ananthapadmanabhan** and K.P. Sreekumar, Tribology Transactions, 52 (2009) 401-404,
49. "Wear Characteristics of Plasma Sprayed Nickel-Aluminum Composite Coatings, ", S.C.Mishra, Alok Satapathy, M.Chaithanya, **P.V.Ananthapadmanabhan** and K.P.Sreekumar, Journal of Reinforced Plastics and Composite. Vol. 28, No. 23/2009, 2931-40.
50. "Three Dimensional Numerical Study of DC Plasma Spray Torch", B Selvan, K Ramachandran, K P Sreekumar, T K Thiyagarajan and **P V Ananthapadmanabhan**, Advances in Applied Plasma Science, Vol.7, 2009.
51. "Plasma Spheroidization and high temperature stability of lanthanum phosphate and its compatibility with molten uranium", **P.V.A.Padmanabhan**, K.P.Sreekumar, T.K.Thiyagarajan, R.U.Satpute, K.Krishnan, N.K.Kulkarni and T.R.G.Kutty,Materials Chemistry and Physics., 113 (2009) 417-421
52. "Characterization and visible light photocatalytic properties of nanocrystalline TiO2 synthesized by reactive plasma processing", M. Vijay, V. Selvarajan, K.P. Sreekumar, Jiaguo Yu, Shengwei Liu, **P.V. Ananthapadmanabhan**, Solar Energy Materials and Solar Cells, Vol. 93 (2009) 1540-1549.
53. "Pulsed laser deposition of lanthanum phosphate protective films", Sucharita Sinha, T. R. G. Kutty, **P. V. A. Padmanabhan**, K. G. K. Warrier, Journal of Laser Applications, VOL.21 (2009) 149-53,.
54. "Evolution of Photocatalytic Properties of Reactive plasma processed nano-crystalline titanium oxide", M. Vijay, **P.V. Ananthapadmanabhan** and K.P. Sreekumar, Applied Surface Science, 255 (2009) 9316-22.