Dr.S.Kumar
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International Advanced Research Centre for Powder Metallurgy and New materials (ARCI)
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Educational Qualifications

Course	School / University	Year Of passing	Percentage of marks
PhD Physics	Department of Physics Bharathiar University Coimbatore – 641 046	2006	#
MSc Physics	Sri Ramakrishna Mission Vidyalaya Coimbatore – 641 020	2001	73.94
BSc Physics	Sri Ramakrishna Mission Vidyalaya Coimbatore – 641 020	1999	80.00

Thesis Title: Plasma spheroidization and in flight formation of aluminides of nickel and iron and their effect on properties of surface coatings.

Research Experience

1. **Scientist E,** October 2020- Till date, International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Balapur. P.O, Hyderabad 500 005, India.

2. **Scientist D,** October 2015- October 2020, International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Balapur. P.O, Hyderabad 500 005, India.

3. **Scientist C**, November 2009 – October 2015, International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Balapur. P.O, Hyderabad 500 005, India.

4. **Postdoctoral Fellow**, December 2006 – November 2009, Neomaterials Hybrid Process Laboratory (National Research Laboratory of Korea for Kinetic Spraying) of the project:
   "Developing the scientific background and industrial application for kinetic spraying process"
   funded by Korea Science and Engineering Foundation (KOSEF)

5. **Junior Research Fellow** (JRF), 8th October 2004 – 30th June 2005 of the project: "Plasma Spheroidization: process development and modeling" funded by Department of Atomic Energy (DAE) - Board of Research in Nuclear Science (BRNS), Mumbai-400 085, India.

6. **Postgraduate Summer Fellowship** for the project on "Thermo luminescence and Photoluminescence of Ce, Tb doped Calcium and Strontium Sulphates" at Health and Safety Division (HAD), Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam, India. May – July and November – December 2000.

Technical Expertise

Finite Element Analysis Software **ABAQUS**
Computational Fluid Dynamics Software **ANSYS Fluent**

Patents

1. An improved gas dynamic cold spray device and method of coating a substrate 2017/1006749 (26/02/17) TEMP/ET/6875/2017-DEL
2. An improved gas dynamic cold spray device and method of coating a substrate PCT/IN/2018/050089
3. Method of producing carbon nanostructure materials for heat transfer, lubrication and energy storage applications 202011017775 (25/04/2020)
4. Anti-clogging cold spray nozzle to deposit clog-prone materials 202211017972 (28/03/2022)

List of main publications in refereed journals

47. Investigations on inter-splat boundaries of cold sprayed NiCr coatings upon high temperature oxidation
G Neelima Devi, A Venu Gopal, S Kumar
Surface and Coatings Technology , 129691 (2023)

46. Cold spraying of *Al*-aerospace alloys: Ease of coating deposition at high stagnation temperatures
Tarun Babu Mangalarapu, S. Kumar, Phanikumar Gandham, Suresh Koppoju
Surface and Coatings Technology, 129703 (2023)

45. Improved microstructure and properties of cold sprayed zinc coatings in the as sprayed condition
Gidla Vinay, Naveen Manhar Chavan, **S Kumar**, A Jyothirmayi, Bolla Reddy Bodapati
Surface and Coatings Technology, Vol 438, 128392 (2022)

44. Influence of inter-splat bonding state of cold sprayed IN625 and IN718 coatings on mechanical and corrosion performance
G Neelima Devi, **S Kumar**, T Sharanya Balaji, Tarun Babu Mangalarapu, S B Chandrasekhar, A Venu Gopal, A Jyothirmayi
Surface and Coatings Technology, Vol 445, 128731 (2022)

43. Precipitation behavior of cold sprayed Al6061 coatings
Tarun Babu Mangalarapu, **S Kumar**, Mantripragada Ramakrishna, Phanikumar Gandham, Koppoju Suresh
Materialia, Vol 24, 101510 (2022)

42. Superconducting niobium coating deposited using cold spray
S Kumar, A S Dhavale, Naveen M Chavan, S Acharya
Materials Letters, Vol 312, 131715 (2022)

41. Generalised bonding criteria in cold spraying: Revisiting the influence of in-flight powder temperature
Gidla Vinay, **S Kumar**, Naveen Manhar Chavan
Materials Science and Engineering A, Vol 823, 141719 (2021)

40. Estimation of inter-splat bonding and its effect on functional properties of cold sprayed coatings
S Kumar, Bolla Reddy Bodapati, Gidla Vinay, K Vamsi Kumar, Naveen Manhar Chavan, P Suresh Babu, A Jyothirmayi
Surface and Coatings Technology, Vol. 420, 127318 (2021)

39. Effect of thermal energy on the deposition behaviour, wear and corrosion resistance of cold sprayed Ni-WC cermet coatings
A.Sai Jagadeeswar, B Venkataraman, **S Kumar**, P Suresh Babu, A Jyothirmayi
Surface and Coatings Technology, Vol. 399, 126138 (2020)

38. First report on cold-sprayed AlCoCrFeNi high-entropy alloy and its isothermal oxidation
Ameey Anupam, **S.Kumar**, Naveen M Chavan, B S Murthy, Ravi Sankar Kotada
Journal of Materials Research (2019)

37. Rapid and scalable synthesis of crystalline tin oxide nanoparticles with superior photovoltaic properties by flame oxidation
Easwaramoorthi Ramasamy, P.Kathirvel, **S.Kumar**, Koppoju Suresh, V.Ganapathy
MRS Communications (2017)

36. Correlation of splat state with deposition characteristics of cold sprayed niobium coatings
S.Kumar, M.Ramakrishna, N.M.Chavan S.V.Joshi
Acta Materialia, 130, 177-195 (2017)

35. Influence of coating defects on the corrosion behavior of cold sprayed refractory metals
S.Kumar, A.Arjuna Rao
Applied Surface Science, 396, 760-773 (2017)

34. Microstructure and performance of cold sprayed Al-SiC composite coatings with high fraction of particulates
S.Kumar, Sai Kiran Reddy, S.V.Joshi
Surface and coatings technology,318, 62-71 (2017)

33. Influence of substrate roughness on bonding mechanism in cold spray
S.Kumar, Gyuyeol Bae, Changhee Lee
Surface and Coatings Technology, 304, 592-605 (2016)

32. Influence of annealing on mechanical and electrochemical properties of cold sprayed niobium Coatings
S.Kumar, A.Jyothirmayi, N.Wasekar, S.V.Joshi
Surface and coating Technology 296,124-135 (2016)

31. Effect of heat Treatment on Mechanical Properties and Corrosion Performance of Cold-Sprayed Tantalum Coatings
S.Kumar,V.Vidyasagar,A.Jyothirmayi, S.V.Joshi
Journal of Thermal spray Technology, 25(4), 745-756 (2016)

30. Study of mechanical properties and high temperature oxidation behavior of a novel cold spray Ni-20Cr coating on boiler steels
N Kaur, M Kumar, S.K.Sharma, D Y Kim, **S.Kumar**, N M Chavan, S.V.Joshi
Applied Surface Science, Vol 328, 13-25 (2015)

29. Development of nanocrystalline cold sprayed Ni-20Cr Coatings for high temperature oxidation resistance
M.Kumar, H.Singh, N.Singh, S.M.Hong, I.S.Choi, J.Y.Suh, N.M.Chavan, **S.Kumar**, S.V.Joshi
Surface and Coatings Technology, Vol 266, 122-133 (2015)

28. Development of erosion corrosion resistant cold spray nanostructured Ni-20Cr coating for coal fired boiler applications
M.Kumar, H.Singh, N.Singh, N M Chavan, **S.Kumar**, S.V.Joshi
Journal of Thermal Spray Technology, 1-9 (2015)

27. Deposition and characterization alpha alumina thin films prepared by chemical bath deposition
P.Kathirvel, J.Chandrasekaran, D.Manoharan, **S.Kumar**
Optik-international journal of Light and Electron Optics, 126 (19)2177-2179 (2015)

26. Preparationa and characterization of alpha alumina nanoparticle by in-flight oxidation of flame synthesis
P.Kathirvel, J. Chandrasekaran, D.Manoharan, **S.Kumar** (2014)
Journal of alloys and compounds, Vol 590, 341-345

25. The elastic modulus of cold spray coatings: influence of inter splat boundary cracking
G.Sundararajan, NM Chavan, **S.Kumar**
Journal of thermal spray technology, Vol 22(8), 1348-1357 (2013)

24. Formation and characterization of f lame synthesized hexagonal zinc oxide nanorods for gas sensor applications
P. Kathirvel, J.Chandrasekaran, D.Manoharan, **S.Kumar**
Ceramics International 39 (2013) 5321–5325 (2012)

23. Oxidation and Crystallization mechanisms in plasma-sprayed Cu-based bulk metallic glass coatings
Junghwan Kim, Kicheol kang, Sanghoon Yoon, **S.Kumar**, Hyuntaek Na, Changhee Lee
Acta Materialia, 58(3) 952-962 (2010)

22. Bonding features and associated mechanisms in kinetic sprayed titanium coatings
Gyuyeol Bae, **S.Kumar**, Sanghoon Yoon, Kicheol Kang, Hyuntaek Na, Hyung-jun Kim, Changhee Lee
Acta Materialia, 57(19). 5654-5666 (2009)

21. Strain-enhanced nanocryatallization of a CuNiTiZr bulk metallic glass coating by a kinetic spraying process
Sanghoon Yoon, Gyuyeol Bae, Yuming Xiong, **S.Kumar**, Kicheol Kang, Jay-Jung Kim, Changhee Lee
Acta Materialia, 57(20), 6191-6199 (2009)

20. Development of cermet coatings by kinetic spray technology for the application of die-Soldering and erosion resistance
Faisal Farooq Khan, Gyuyeol Bae, Kicheol Kang, **S.Kumar**, Techo Jeong, Changhee Lee
Surface and Coatings Technology, 204 (3), 345-352 (2009)

19. Effect of powder state on the deposition behavior and coating development in Kinetic Spray Process
S.Kumar, G.Bae and C.Lee
Journal of Physics D: Applied Physics, 49, 075305 (2009)

18. Particle states in plasma and their effects on properties of Ni/YSZ spray coatings for SOFC anode application.
O.Kwon, **S.Kumar**, S.Park and C.Lee
Journal of Ceramic Processing Research, 10(2), 139-143 (2009)

17. Advanced deposition characteristics of kinetic sprayed bronze/diamond composite by Tailoring feedstock properties.
H.Na, G.Bae, S.Shin, **S.Kumar**, H.Kim and C.Lee
Composite Science and technology, 69, 463-468 (2009)

16. Spectral inverstigations of chemical bath deposited zinc oxide thin films – ammonia gas sensor.
P.Kathirvel, S.M.Mohan, D.Manoharan and **S.Kumar**
Journal of Optoelectronics and Advanced Materials, 1, 25-33 (2008)

15. Effects of silver addition on mechanical properties of plasma sprayed interconnect layer.
S.Park, **S.Kumar**, H.Na and C.Lee
Journal of Thermal Spray Technology, 17(5-6), 708-714 (2008)

14. Deposition characteristics of copper particles on roughened substrates through kinetic spraying
S.Kumar, Gyuyeol Bae and Changhee Lee
Applied Surface Science, 255(6), 3472-3479 (2008)

13. Phase dependence of Fe based bulk metallic glasses on properties of thermal spray coatings.
S.Kumar, Junseoub Kim, Hwijun Kim and Changhee Lee
Journal of Alloys and Compounds, 475(1), L9-L12 (2008)

12. Influence of metal powder shape on drag coefficient in a spray jet
S.Kumar, Hyuntaek Na, V.Selvarajan, Changhee Lee
Current Applied Physics (Article in press) (2008)

11. General aspects of interface bonding in kinetic sprayed coatings
Gyuyeol Bae, Yuming Xiong, **S.Kumar** and Changhee Lee
Acta Materialia, 56 (17), 4858 – 4868 (2008)

10. Synthesis and Characterization of Alumina Nano-Powders by Oxidation of Molten Aluminium in a Thermal Plasma Reactor: Comparison with Theoretical Estimation
S.Kumar, Kicheol Kang, Gyuyeol Bae, V.Selvarajan and Changhee Lee
Materials Chemistry and Physics Vol. 112, 436 - 441 (2008)

09. Characterization and comparison between APS coatings prepared from ball milled and plasma processed nickel - aluminium powders.
S.Kumar, V.Selvarajan, P.V.A.Padmanabhan and K.P Sreekumar
Materials Science and Engineering A, Vol. 486 (1-2), 287-294. (2008)

08. Plasma spheroidization of iron powders in a non-transferred DC thermal plasma jet.
S.Kumar and V.Selvarajan
Materials Characterization, Vol. 59 (6), 781-785. (2008)

07. Development and microstructure optimization of atmospheric plasma-sprayed NiO/YSZ anode coatings for SOFCs.
Sooki Kim, Ohchul Kwon, **S.Kumar**, Yuming Xiong and Changhee Lee
Surface and Coatings Technology, Vol. 202 (14), 3180-3186. (2008)

06. Comparison of solid oxide fuel cell anode coatings prepared from different feedstock Powders by atmospheric plasma spray method.
Ohchul Kwon, **S.Kumar**, Soodong Park and Changhee Lee
Journal of Power Sources, Vol. 171 (2), 441-447. (2007)

05. Formation of Doughnut shaped aluminium particles in a DC non transferred argon thermal plasma jet.
S.Kumar and V.Selvarajan
Vacuum, Vol. 81 (8), 1016-1021. (2007)

04. Spheroidization of Metal and Ceramic Powders in Thermal Plasma Jet: Comparison between Experimental Results and Theoretical Estimation
S.Kumar, V.Selvarajan, P.V.A.Padmanabhan and K.P.Sreekumar
Journal of Materials Processing Technology, Vol. 176 (1-3), 87-94. (2006)

03. In-flight formation and Characterization of Nickel aluminide in a DC thermal plasma jet.
S.Kumar and V.Selvarajan
Chemical Engineering and Processing, Vol. 45 (12), 1029 -1035. (2006)

02. Characterization and comparison between ball milled and plasma processed iron – aluminium thermal spray coatings.
S.Kumar, V.Selvarajan, P.V.A.Padmanabhan and K.P.Sreekumar
Surface and Coatings Technology, Vol. 201 (3-4), 1267 – 1275. (2006)

01. Spheroidization of metal and ceramic powders in thermal plasma jet
S.Kumar and V.Selvarajan
Computational Materials Science, Vol. 36 (4), 451- 456. (2006)

International Conference / Workshop / Seminar

1. Workshop on plasma Physics, "Capacity Building in Plasma Applications and Diagnostic Techniques", 7 – 11 March 2005, the Abdus Salam International Centre for Theoretical Physics (ICTP), Strada Costiera 11, 34014 Trieste, Italy.

2. Role of roughness induced frictional dissipation in kinetic spray bonding mechanism

S. Kumar, Gyuyeol Bae, Hyuntaek Na, Changhee Lee
3rd Asian Thermal Spray Conference, November 6 – 8, 2008, **Singapore**.

3. ARCI-McGill University Joint Meeting
Montreal, **Canada** December 2010.

4. 6th Asian Thermal Spray Conference, November 24-26, 2014, Hyderabad, **India**

5. Microstructure and performance of cold sprayed Al-SiC composite coatings with high fraction of particulates
S.Kumar, Sai Kiran Reddy, S.V.Joshi
7th RIPT conference, 9-11, 2015, Limoges, **France**

Membership / Other responsibilities

Life member, Materials Research Society of India

Principal Investigator (Industrial / Research projects)

1. Development of Tin and Zn/ZrO2 and Cu/ZrO2 coatings on aluminum bus bar for electrical applications funded by **Siemens Ltd**, Bangalore. – 2.90 lakh.

2. Development of Ni-Cr and In-625 coatings on steel funded by **GE India Pvt. Ltd**, Bangalore, - 3.50 lakh.

3. Development of superconducting Niobium cavity funded by Board of Research in Nuclear Sciences (**BRNS**), Mumbai – 24.50 lakh.

4. Refurbishment of aerospace aluminum and aluminum alloy parts by cold spray funded by **Boeing**, USA – 100.00 lakh.

5. Development of Refractory metals and composite coatings for protecting Electromagnetic rail by cold spray technique funded by Armament Research and Development Establishment (**ARDE**),New Delhi- 36.87 lakh.

6. Development of Titanium coatings on steel and PEEK substrates for biomedical applications funded by **Wissencraft Labs Pvt. Ltd**, Pune

Co-Investigator (Industrial / Research projects)

1. Development of High Entropy Alloy(HEA) coatings as potential bond-coat materials for high temperature turbine engine applications(GTMAP) funded by Aeronautics Research and Development Board (**ARDB**),New Delhi- 50 lakh. (In collaboration with IIT Madras)

2. Development of Copper coating on SS 304 for IIT Ropar funded by Board of Research in Fusion Science and Technology (**BRFST**)- 3.0 lakh.