

## CURRICULUM VITAE

### Dr PRAMOD S L

Ph.D (Indian Institute of Technology Madras)  
Prasadam, Kurumkuttu, Parassala, Trivandrum,  
Kerala – 695502, India.  
Mobile: +91-9787174959  
E mail: slpramod@gmail.com  
Webpage: <https://sites.google.com/site/slpramod>



### OBJECTIVE

To be part of a professional, competitive and healthy research environment where I can play an innovative role and use my capabilities to the fullest to attain the objectives of the institution and at the same time enhance my skill set to further the cause.

### RESEARCH EXPERTISE

- Materials for automotive and structural applications.
- Casting of Aluminium (Al) and Magnesium (Mg) based alloys and composites.
- Casting of Grey Cast Iron: Green sand system and PUCB & Shell core making.
- Microstructural modification, grain refinement and age hardening in Al alloys.
- Tribological and mechanical properties of alloys and composites.

### EDUCATION

- Ph.D  
Department of Metallurgical and Materials Engineering,  
Indian Institute of Technology Madras, Chennai, Tamil Nadu  
CGPA: 7.5, Year of graduation: 2016.  
Thesis title: “*Effect of Sc on the microstructure, mechanical and wear behavior of A356 alloy and A356 -5TiB<sub>2</sub> in situ composite*”
- M. E.  
Industrial Metallurgy  
Department of Metallurgical Engineering,  
PSG college of Technology, Coimbatore, Tamil Nadu,  
Affiliated to Anna University, Coimbatore.  
CGPA: 9.2, Year of graduation: 2010.
- B. E.  
Mechanical Engineering  
Department of Mechanical Engineering,  
Noorul Islam College of Engineering, Kanyakumari, Tamil Nadu,  
Affiliated to Anna University, Chennai.  
Percentage: 75%, Year of graduation: 2008

## WORK EXPERIENCE

- Manager/Lead Engineer - Advanced Technology (Materials & Metallurgy).

May 2018 - Present

Mahindra & Mahindra Ltd.

- Manager, Technology - Metallurgist.

1 year 6 months (November 2016 - April 2018),

Ashok Leyland Ltd. Foundry Division (Hinduja Foundries)

## SUMMARY OF Ph.D RESEARCH

**Title:** *Effect of Scandium on the microstructure, mechanical and wear behaviour of A356 alloy and A356-5TiB<sub>2</sub> in-situ composite.*

The present research work investigates the effect of Sc on the secondary dendritic arm spacing (SDAS), eutectic Si modification, inter-metallic phase modification, T6 artificial aging behavior and subsequently on the mechanical and high temperature wear behavior in A356 alloy and A356-5TiB<sub>2</sub> *in-situ* composite.

- Addition of 0.4 wt.% Sc in A356 alloy resulted in a 50% reduction in the secondary dendritic arm spacing (SDAS). Al<sub>3</sub>Sc particles act as a heterogeneous nucleation sites for  $\alpha$ -Al during solidification of A365-Sc alloy resulting in grain refinement.
- Sc addition changed the morphology of eutectic Si from plate like to fibrous and globular. In case of hypoeutectic Al-Si alloys, Si growth is by twin plane re-entrant edge (TPRE) growth mechanism and eutectic Si is in plate like morphology. Twins are the significance of TPRE growth and were found over the growth direction of Si in unmodified eutectic Si. Twins were not observed in eutectic Si and for Sc added A356 alloy. This clearly indicate that the Si growth is not by TPRE mechanism. Hence, poisoning of TPRE growth or restricted TPRE growth mechanism was proposed, which is responsible for the modification of eutectic Si in Sc added A356 alloy.
- Transmission electron microscopy (TEM) diffraction pattern, Energy dispersive spectroscopy (EDS) and XRD (X ray diffraction) analysis revealed the presence of  $\beta$ -Al<sub>5</sub>FeSi and  $\pi$ -Al<sub>8</sub>Mg<sub>3</sub>Si<sub>6</sub>Fe<sub>1</sub> phases in A356 alloy. Addition of Sc to A356 alloy resulted in an additional V-AlSi<sub>2</sub>Sc<sub>2</sub> phase formation and changed  $\beta$  and  $\pi$  phases to Sc containing  $\beta$ -Al<sub>5</sub>Fe(Si,Sc),  $\pi$ -Al<sub>8</sub>Mg<sub>3</sub>(Si,Sc)<sub>6</sub>Fe<sub>1</sub> phases. The  $\beta$ -Al<sub>5</sub>Fe(Si,Sc) phase is finer sized and irregular morphology compared with needle like morphology  $\beta$ -Al<sub>5</sub>FeSi phase.

- Addition of 0.4 wt.% Sc to A356 alloy improved its Vickers hardness, Ultimate tensile strength (UTS), Yield strength (YS) and Ductility by 20%, 25%, 20% and 30% respectively. Whereas, A356-5TiB<sub>2</sub>-0.4Sc *in-situ* composite showed a 30%, 24%, 33% and 7% improvement in Vickers hardness, UTS, Yield strength and Ductility respectively, compared with A356 alloy. Artificial aging treatment (T6) resulted in significant improvement in the tensile properties for both A356 and Sc added A356 alloys.
- Pin-on-disk wear test results indicated that Sc addition improves the wear resistance of A356 alloy and A356-5 wt.% TiB<sub>2</sub> composite at ambient, 150°C and 250°C temperature test conditions.

## M. E. PROJECT

### ***Title: Processing and characterization of Silicon Carbide (SiC) reinforced functionally graded aluminium matrix composites using centrifugal casting.***

Functionally graded A356-15 wt.% SiC composite disks were fabricated by centrifugal casting for clutch plate application in defense battle tank. The outer periphery of the clutch plate requires high strength and wear resistance since these are continuously engaging/disengaging while operation. The processing parameters, pouring temperature and rotation speed were optimized to get a graded microstructure without porosity and shrinkage. The tensile and wear properties showed significant improvement in the outer periphery relative to inner periphery of the disk. This work was carried out in National Institute for Interdisciplinary Science and Technology (CSIR), Trivandrum, Kerala, India as a part of a project with Combat Vehicles Research and Development Establishment.

## B. E. PROJECT TITLE

- Design and fabrication of four-wheel steering mechanism for automobiles.

## OTHER PROJECTS

- Effect of Carbon Nano-Tube (CNT) dispersion on mechanical properties of Al and Al-Si alloy matrix composites.
- Development of biodegradable Mg-HAP composites using Spark plasma sintering (SPS).
- Development of multi-component High Entropy alloys using Spark plasma sintering (SPS).
- Nanomechanical and Nanotribological properties of Nanocrystalline Nickel coatings.
- Optimizing green sand properties for high pressure moulding by selection of proper Bentonite and Lustrous carbon.

## JOURNAL PUBLICATIONS

- **S. L. Pramod**, Ravikirana, A. K. Prasada Rao, Srinivasa R. Bakshi and B. S. Murty, Microstructure and mechanical properties of as-cast and T6 treated Sc modified A356-5TiB<sub>2</sub> in-situ composite, *Materials Science and Engineering A*, 739, 2019, 383-394.
- **S. L. Pramod**, A. K. Prasada Rao, B. S. Murty and Srinivasa R. Bakshi, Effect of Sc addition on the microstructure and wear properties of A356 alloy and A356-TiB<sub>2</sub> in situ composite, *Materials & Design*, 78, 2015, 85-94.
- **S. L. Pramod**, Srinivasa R. Bakshi and B.S. Murty, Aluminum Based Cast in situ Composites – A Review, *Journal of Materials Engineering and Performance*, 24, 2015, 2185-2207.
- **S. L. Pramod**, Ravikirana, A. K. Prasada Rao, Srinivasa R. Bakshi and B. S. Murty, Effect of Sc addition and T6 aging treatment on the microstructure modification and mechanical properties of A356 alloy, *Materials Science and Engineering A*, 674, 2016, 438-450.
- Prathap Chandran, Tadepalli Sirimuvva, Niraj Nayan, A.K. Shukla, S.V.S.Narayana Murty, **S. L. Pramod**, S.C. Sharma, and Srinivasa R. Bakshi. "Effect of Carbon Nanotube Dispersion on Mechanical Properties of Aluminum-Silicon Alloy Matrix Composites", *Journal of Materials Engineering and Performance* 23, 2014, 1028-1037.

## SELECTED CONFERENCE PRESENTATIONS

- **S. L. Pramod**, A. Elsayed, Srinivasa R. Bakshi, B.S. Murty, C. Ravindran. "Processing and mechanical properties evaluation of in-situ Magnesium AZ91- TiB<sub>2</sub>/TiC reinforced composites". 5th International Conference on Solidification Science and Processing (ICSSP-5), 19-22 Nov. 2012, Bhubaneswar, India.
- **S. L. Pramod**, A. K. Prasada Rao, B. S. Murty and Srinivasa R. Bakshi. "Effect of Sc addition on microstructure and mechanical properties of A356 alloy and A356 -10 wt.% TiB<sub>2</sub> in-situ composites", *International Conference on Recent Advances in Composite Materials (ICRACM-2013)*, 18-21 Feb, 2013, Goa, India.
- **S. L. Pramod**, A. K. Prasada Rao, S. R. Bakshi, B. S. Murty, "Effect of Sc addition on the grain refinement, Si modification and mechanical properties of A356 and A356-10 wt.% TiB<sub>2</sub> in-situ composites", *National Metallurgical Day – Annual Technical Meeting (NMD-ATM 2013)*, 12-15 November, 2013, Varanasi, India.
- **S. L. Pramod**, A. K. Prasada Rao, B. S. Murty and Srinivasa R. Bakshi, "Effect of Sc addition on microstructure, mechanical and wear properties in A356 alloy and A356-TiB<sub>2</sub> composites" *Innovation in Processing of Light Metals for Transportation Industries: A*

Symposium in Honor of C. Ravi Ravindran, Materials Science and Technology Conference, (MS&T14), October 12-16, 2014, Pittsburgh, USA

- **S. L. Pramod**, A. K. Prasada Rao, B. S. Murty and Srinivasa R. Bakshi, "Effect of Sc addition on the microstructural modification and mechanical properties in A356 alloy and A356-TiB<sub>2</sub> composite" Advances in Metal Casting Technologies, Materials Science and Technology Conference, (MS&T15), October 04-08, 2015, Columbus, USA.

## TECHNICAL EXPERTISE

- Software: X'Pert High Score Plus XRD analysis software, Autocad, Microcal Origin.
- Hands on experience in stir casting and centrifugal casting of Al, Mg alloys and composites.
- Hands on experience in Fritch planetary ball mill and Zoz Simoloyer high energy ball mill.
- Metallographic techniques – Preparation of samples and handling optical microscope with polarizer.
- Scanning Electron Microscope – Hands on experience on FEI Quanta – 200, Quanta – 400 and Inspect-F.
- Experience in operating Pin on disk wear test instrument, Instron mechanical tester and Vickers hardness tester.
- XRD – Experience in operating PaNalytical Xpert instrument and analysis using Xpert high score plus software.
- Nanoindentation – Hands on experience on Hysitron Tribo Indenter TI 950.

## TEACHING/RESEARCH ASSISTANTSHIPS

- In-charge for Nanoindentation and X-ray Diffraction Laboratory for a period of two years.
- Taught X-ray Diffraction Laboratory classes for B.Tech and M.Tech students.
- Taught Nanoindentation and AFM lab classes for classes for B.Tech and M.Tech students.

## ACHIEVEMENTS

- Best Project Award of ME Industrial Metallurgy of 2008-2010 batch, PSG college of Technology.
- Best Outgoing Student Award of ME Industrial Metallurgy of 2008-2010 batch, PSG college of Technology.
- GATE - Mechanical Engineering-2008.
- Canadian Commonwealth Scholarship from Canadian Bureau for International Education (CBIE) and Foreign Affairs and International Trade Canada (DFAIT) to undergo research work in Ryerson University, Toronto, Canada for four months (15 March – 15 July, 2012).

## POSITIONS OF RESPONSIBILITIES

- Chair, Material Advantage Student Chapter, IIT Madras (2011-2013).
- Active representation in organizing technical events at UG, PG and Ph.D levels.
- Technical committee member for ISRS 2012 and ISRS 2014 international conferences.

## PROFESSIONAL BODY MEMBERSHIPS

- Indian Institute of Metals (IIM Chennai Chapter).
- American Society of Metals (ASM Chennai Chapter).
- Life Member of Electron Microscopy Society of India.
- Member of Society of Automotive Engineers (SAE India).

## PERSONAL DETAILS

Date of Birth : 01/06/1987  
Sex : Male  
Marital status : Single  
Nationality : Indian  
Languages known: English, Malayalam, Tamil and Hindi.

## REFERENCES

### **Prof. B. S. Murty**

Professor,  
Dept. of Metallurgical and Materials  
Engineering,  
Indian Institute of Technology, Madras, India,  
Email: murty@iitm.ac.in  
Phone: +91-9444077006

### **Dr. Srinivasa Rao Bakshi**

Associate Professor,  
Dept. of Metallurgical and Materials  
Engineering,  
Indian Institute of Technology, Madras, India,  
Email: sbakshi@iitm.ac.in  
Phone: +91-9444903710

## DECLARATION

I hereby declare that the above information is true to the best of my knowledge and belief.

Place: Chennai

Date: 19/12/2018

Pramod S L