

## Curriculum vitae of Dr. T.R. Ramachandran

**I. Name and Present Address:** Dr. T.R. Ramachandran  
Visiting Professor  
Nonferrous Materials Technology Development  
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**II. Date of Birth:** April 10, 1937

**III. Qualifications:**

<b>Degree</b>	<b>Subject</b>	<b>Class</b>	<b>University</b>	<b>Year</b>
B.Sc. (Hons.)	Chemistry	I	Sri Venkateswara	1958
B.E.	Metallurgy	Distinction	Indian Institute of Science	1960
M.Sc.	Metallurgy		McMaster Canada	1965
Ph.D.	Metallurgy		Wales, UK	1969

**IV. Positions Held:**

<b>Position</b>	<b>Institution</b>	<b>Period</b>
Visiting Professor	Nonferrous Materials Technology Development Centre Hyderabad	2004-to date
Emeritus Scientist	Nonferrous Materials Technology Development Centre Hyderabad	1999-2004
Founder Director	Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC) Nagpur	1989-99

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#### IV. Positions Held (contd.)

Position	Institution	Period
National Project Director, UNDP project	Jawaharlal Nehru Aluminium Research Development and Design Centre Nagpur	1989-95
Visiting Professor/ Scientist	McMaster University	Summers 1979, '81, '85 and '86
Head Materials Science Programme	IIT Kanpur	1988-89
Head Metallurgical Engineering Department	IIT Kanpur	1986-88
Foreign Students Advisor	IIT Kanpur	1981-86
Professor	IIT Kanpur	1978-89
Convenor Central Electron Microscope Facility	IIT Kanpur	1975-76, 1978-84
Assistant Professor	IIT Kanpur	1971-76
Lecturer	IIT Kanpur	1969-71
Lecturer	IIT Bombay	1963-64
Associate Lecturer	IIT Bombay	1961-63
<i>Mentor</i>	<i>Freshly recruited Teaching Staff Members, Metallurgical Engineering, NIT Trichy</i>	<i>Oct 2008-March 2009</i>
<i>Visiting Professor</i>	<i>Homi Bhaba National Institute, IGCAR Kalpakkam</i>	<i>April 2011</i>
<i>Adjunct Faculty</i>	<i>IIT Bhubaneswar</i>	<i>March 2014</i>

#### V. Professional Experience since 1989:

As the Founder-Director of JNARDDC, I have been involved in the following activities:

- i. Co-ordination with UNDP/UNIDO in the selection of international experts to be fielded at the Centre, arrangement of training for the local staff in well established aluminium centres in Switzerland, Norway, Hungary, Venezuela, Canada and Jamaica and selection of equipment to be procured for the Centre
- ii. Played an active role in preparing the specifications, selection and ordering of equipment worth about US \$ 2.2 Million from the UNDP funds.

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## V. Professional Experience since 1989: (contd.)

- iii. Setting up the facilities of the Centre including planning of laboratories and overall co-ordination of all activities related to civil, electrical and AC facilities
  - iv. Recruitment of staff members for the Centre - in view of the fact that the expertise available is limited, extensive search has been made in locating these staff members.
  - v. Interaction with industries : A number of R&D problems were selected for further investigations based on extensive discussion with the plant personnel.
  - vi. Actively involved in the organisation and lecturing in several workshops / lectures for industrial participants with the assistance of the experts from UNDP/ UNIDO; topics for workshop include Alumina technology, Aluminium Electrolysis, Aluminium Cast House Technology and Heat treatment of aluminium alloys.
- On the Board of Directors of the National Aluminium Company (1991-93), Bharat Aluminium Company Limited (1994-97), Paradeep Carbons (2002-06) and Alufluoride (2004-to date)
  - Member, Steering Committee for RSICs/SIFs, Ministry of Science & Technology; Member of Sophisticated Instrumentation Facility, All India Institute of Medical Sciences, New Delhi, 1990 - 1993 and Centre Management Committee, Regional Sophisticated Instrumentation Centre, Nagpur 1996- 1999
  - Chairman of the Monitoring Committee for the project on Special Alumina Production in NALCO, sponsored by the DSIR under the PATSER Programme, 1995-1999; Chairman of the Monitoring Committee of TIFAC on the Project "Al-based MMC's for Automobile Applications", 1998-99
  - Member, Review Committee of the project on Development of Low Temperature Electrolytes for Aluminium Electrolysis sponsored by the Ministry of Power Government of India at the CECRI Karaikudi 1995-98.
  - Leader of the Task Force for the report on Aluminium – the Directorate General of Technical Development Ministry of Industry Government of India, 1992-93; the report was submitted to DGTD in May 1993.
  - Co-ordinator for the report on Source Paper on Aluminium, published in 1998 Indian Institute of Metals and TIFAC.
  - Member of the Programme Advisory Committee on Materials, Mining and Mineral Engineering, Ministry of Science and Technology, Government of India, 1995 - 1997
  - Part time member of the Audit Board (Controller and Auditor General of India) of National Aluminium Company Ltd., Bhubaneswar for review and comprehensive performance appraisal, 1997-2000.
  - Member, Research Council, RRL Bhopal (1989-1999), CECRI Karaikudi (1992-97) and RRL Trivandrum (1998-2001)
  - Member, Enquiry Committee on the performance of the National Aluminium Company Ltd. Set up by the Ministry of Mines, Government of India, June 1998; Chairman, Enquiry Committee on the Performance of the Bharat Aluminium Company Ltd. August- September 1998

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**V. Professional Experience since 1989 (contd.)**

- Member, Laxminarayan Institute of Technology Committee, Nagpur 1997-1999; Member, Nagpur University, Board of College and University Development, 1996-1999; Member, Amravati University, Board of College and University Development, 1997-1999
- Council Member, Indian Institute of Metals, 1993-94, 1994-95; Member, Editorial Advisory Board, Transactions of the Indian Institute of Metals, 1993- 1999
- Honorary Member Governing Council of Aluminium Association of India, 1993- 1999
- Member, Light Metals and their Alloys: Sectional Committee MTD 7, Bureau of Indian Standards 1992-1999
- Executive Director, ICSOBA, 2009 –2011

**VI. Research Experience:**

<b>Institution</b>	<b>Period</b>	<b>Project</b>
Nonferrous Materials Technology Development Centre	1999-to date	Building up data bank of published literature and patent documents (Al-Ti-B, Al-Si, Al-Ti-C and Al-B alloys) and production of the refiners and master alloys and their characterization, use of the materials for grain refinement, electrical conductivity improvement and modification in eutectic Al-Si.
McMaster University	Summers of 1985 & '86	Plastic strain gradients around second phase particles and their role in recrystallisation in aluminium alloys using convergent beam diffraction and 2 1/2 D microscopy
IIT Kanpur	1980-89	Recrystallisation, quenched-in vacancies and precipitation studies on commercial Al alloys using electrical resistivity measurements and electron microscopy; electron optical studies on precipitation in Al-Li-Cu-Mg alloys; phase identification studies in zinc ores; DTA, Mossbauer spectroscopy and electron microscopy of Fe-B metallic glasses; electron optical studies on solar cell materials
University of Wales & McMaster University	1976-78, Summers of 1979 & '81	Electron microscopic and microanalytical studies on the nature of insolubles in commercial aluminium

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## VI. Research Experience (contd.):

IIT Kanpur	1970-75	X-ray studies on the decomposition of splat cooled Al-Mn alloys; Kinetics of annealing of quenched-in vacancies in Al-Cr and Al-Mn alloys using electrical resistivity measurements and electron microscopy; Serrated yielding in Al-Mg and Al-In alloys
University of Wales	1966-69	Electron microscopic study of the kinetics of annealing of dislocation loops in quenched Al, Al-In, Al-Si and Al-Zn alloys.
McMaster University	1964-65	Electron microscopic study of dislocation etch pits in LiF
IIT Bombay	1961-64	Oxygen top blowing of copper matte
Indian Institute of Science	1960-61	Oxidation of Cu-Cr alloys

## VII. Technical Presentations from 2005:

I have lectured extensively in reputed institutions in India and abroad on various topics with emphasis on aluminium alloys, electron microscopy, sustainable development, scrap recycling and energy conservation in aluminium industry. Besides I have been involved in conducting full fledged courses on electron microscopy in a number of IITs, NITs, CSIR laboratories, universities and industries – these activities involved preparation of course material, delivering lectures and conducting tutorial sessions. Information on the lectures delivered since April 2005 is given below:

- Lectures on Aluminium alloys and nanocomposites, IIT Bhubaneswar March 2014
- Lectures on Electron Microscopy MEPCO-SCHLENK Engineering College Virudhunagar Feb 2014
- Lectures on Electron Microscopy IIT Gandhinagar January 2014
- Lectures on Electron Microscopy, NFTDC, July 2013
- Lectures on Electron Microscopy, CARE, Trichy, March 2013
- Characterisation Techniques in Corrosion and Surface Engineering, CECASE, NITT, Dec 2012
- Scrap recycling in sustainable development of aluminium industry, IBAAS Meet Nagpur November 2012
- Lectures on Aluminium Alloys, Annamalai University, Nov 2012
- Lectures on Electron Microscopy and X-rays, CMET Hyderabad, Oct 2012
- Lectures on Electron Microscopy, NIT Trichy, Dec 6-8, 2011. (contd.)

## **VII Technical Presentations from 2005(contd.):**

- Lectures on Electron Microscopy, BESU Shibpur, Sept 2011; NFTDC December 2011
- Series of lectures on “Design of Nonferrous Alloys” as Visiting Professor in Homi Bhabha National Institute in IGCAR Kalpakkam, April 2011.
- Lectures on Aluminium Alloys in IT, BHU on March 25, 2011.
- Short Term Course on Scanning Electron Microscopy for Beginners, BESU, Shibpur, Feb 7-11, 2011.
- NML Diamond Jubilee Lecture on Sustainable Development of Aluminium Industry, Dec 13, 2010
- A course on Electron Microscopy in Thiagarajar College of Engineering, Madurai, Dec 6-8, 2010.
- A series of lectures on Electron Microscopy in the University of Hyderabad Aug-Sept 2010.
- A course on Transmission Electron Microscopy, TISCO Jamshedpur and NML, Jamshedpur, April 5-9, 2010.
- “Technological Challenges to Aluminium Scrap Recycling”, IIT Kanpur March 2010
- Series of Lectures on Electron Microscopy, IIT Kanpur, March 2010
- Series of Lectures on Electron Microscopy, Central Electrochemical Research Institute, Karaikudi, August 2009.
- Short Term Course on Electron Microscopy, Central Glass and Ceramic Research Institute, Kolkata, June 29- July 1, 2009.
- Series of Lectures on Electron Microscopy, Government College of Engineering, Salem, March 2009.
- Developments in Light Alloys Processing – Opportunities and Challenges, CSIR Foundation Day Lecture, AMPRI Bhopal, Sept 26, 2008
- All the lectures in the Three Days Short Term Course on Electron Microscopy, NIT Trichy, Sept 6-8, 2008
- Series of lectures on electron microscopy, IIT Bombay, March 24 to 28, 2008.
- All the lectures in the Workshop on electron microscopy, NITK Surathkal, March 8 to 10, 2008.
- Grain refinement of Light alloys, World Foundry Congress, Chennai Feb 8 - 10, 2008.
- All the lectures on electron microscopy, IIT Kharagpur, Oct 29 to Nov 2, 2007
- All the lectures in the Workshop on electron microscopy, IIT Roorkee, Oct 3 to 11, 2007.
- Technological advances in recycling of aluminium alloy scrap, XI International Conference on nonferrous minerals and metals, Raipur, July 6-7, 2007
- Lectures and tutorials on electron microscopy, June 11-13, 2007, IGCAR Kalpakkam
- Melt Treatment of aluminium alloys and Heat treatment of aluminium alloys, National Aluminum Company Angul, April 14 &15, 2007

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## **VII. Technical Presentations from 2005 (contd.):**

- Workshop on electron microscopy, NIFFT Ranchi, course of ten lectures on specimen-electron beam interaction, constructional details, diffraction patterns, contrast in images and X-ray microanalysis, April 2 to 5, 2007
- Electron beam interaction in materials and electron microscopy of high strength aluminium alloys, NITK, Surathkal, March 30, 2007
- High strength light alloys, IGCAR Kalpakkam, Feb 2007
- Workshop on electron microscopy, NML Jamshedpur, course of ten lectures on specimen-electron beam interaction, constructional details, diffraction patterns, contrast in images and X-ray microanalysis, Jan 22 to 24, 2007.
- Series of lectures in the Workshop on aluminium alloys IIM Pune chapter Dec 2006
- High Strength Aluminium Alloys, IIM Chapter lecture, TRDDC Pune Oct 2006
- Grain Refinement of Aluminium Alloys, Sundaram-Clayton Chennai, March 2006
- Series of lectures on Electron Microscopy, BESUS, Feb 2006
- Aluminium Alloys, Crompton & Greaves R&D Centre Mumbai, Feb 2006
- Grain Refinement of Aluminium Alloys, IIT Bombay Feb 2006
- Aluminium Scrap Recycling, MMR Seminar on Scrap Recycling, Mumbai Jan 2006
- Metallurgical Aspects of Al-Si Alloys, Sundaram-Clayton, Chennai Dec 2005
- Melt Treatment of Aluminium Alloys, P.K. Sharma, T.R. Ramachandran and K. Balasubramanian, ICSOBA Nagpur November 2005
- Trace Elements in Aluminium Alloys, ICSOBA Nagpur Nov 2005
- Energy Conservation and Environmental Aspects of Aluminium Industry, NML Jamshedpur, Aug 2005 & BESUS Aug 2005, RRL Bhopal Jan 2005
- Melt Treatment of Aluminium Alloys, Jamshedpur, Aug 2005, RRL Bhopal Jan 2005
- High Strength Aluminium Alloys, NML Jamshedpur, Aug 2005 & BESUS Aug 2005, RRL Bhopal Jan 2005
- Grain Refinement of Aluminium Alloys, IGCAR June 2005
- Series of lectures on Electron Microscopy, IIT Bombay April 2005

#### **VIII. Consultancy Work Undertaken:**

- As the Director of JNARDDC I have been associated with various research and Consultancy projects in the areas of bauxite characterisation, alumina production, monitoring of aluminium electrolysis, energy audit and waste treatment. In addition the plant personnel (particularly from BALCO and NALCO) have been in touch with me about problems in the areas of cast house technology, alloy production and heat treatment; assisted several other industries in these areas, including Crompton and Greaves, Sundaram Clayton and McNally Bharath in solving some of their problems.

#### **IX Monographs and Editorship**

- **Proceedings of the International Conference on Progress in Metallurgical Research; fundamental and Applied Aspects**, eds. S.P. Mehrotra and T.R. Ramachandran, Tata-McGrawhill, New Delhi 1986.
- Guest Editor of the Jan – March 1991 (Vol. 2, no. 4) issue of **Metals, Materials and Processes**.
- **Source Book on Aluminium**, a monograph for the Indian Institute of Metals and TIFAC - the monograph includes detailed write up on general production and consumption figures in the country and projections, bauxite, alumina, special alumina, aluminium electrolysis, pollution control, molten metal treatment, grain refinement, designation, thermal treatment and applications of aluminium and its alloys, Al-Li alloys, Al-based composite materials, processing of aluminium alloys, recycling, technology sourcing, training and education and Challenges to the Indian aluminium industry. Data available for a number of plants in the world have been analysed and presented in the monograph.
- Coauthor of the Chapter “**PHASE DIAGRAMS AND PHASE REACTIONS IN Al-Li ALLOYS**”, Book on Al-Li alloys, Elsevier, USA, 2013.

#### **X. Membership of Professional Societies:**

- Life Member, Indian Institute of Metals
- Life Member, Materials Research Society of India
- Member of the Executive Committee of the International Committee for Study of Bauxites, Alumina and Aluminium(ICSOBA) (1993-98); Executive Director ICSOBA 2009-11

#### **XI. Awards and Academic Honours**

- Life time achievement Award, Electron Microscope Society of India, July 2012.
- Nalco Gold Medal of the Indian Institute of Metals, 2006 (first year of inception) for outstanding contributions to the aluminium industry
- Hindustan Zinc Gold Medal of the Indian Institute of Metals, 1994 for significant contributions to Nonferrous Metallurgical industry.
- Certificate of Appreciation from AIME 1987
- Award winner in the Metallographic contest organised by the American Society of Metals in 1965

#### **XII. Research Publications:**

Nearly 100 publications in international and national journals and conference proceedings with emphasis on aluminium alloys, electron microscopy, energy conservation in aluminium industry, melt treatment, preprecipitation / precipitation in aluminium alloys.