ARUN KUMAR, Ph.D.
PRESIDENT
SEAL Laboratories
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SPECIALIZED PROFESSIONAL COMPETENCE:

Failure analysis of metallic and non-metallic (glass, plastic, ceramic, composites, rubber) materials and electronic components; fractography and fracture analysis; physical metallurgy; high and low temperature oxidation and corrosion of metals and alloys; corrosion protection; heat treatment of metals and alloys; coating development; evaluation of welding, brazing, and soldering techniques; scanning and transmission electron microscopy; electron microprobe analysis; surface analysis techniques; x-ray diffraction; residual gas analysis (RGA); cost-effective material selection, product development, and manufacturing process improvement; assistance as an expert witness, product liability trials.

Extensive experience in metallurgical failure analysis of aircraft, helicopter, automobile and motorcycle components, machineries, medical implants, machine tools and household appliances.

EXPERIENCE:

SEAL LABORATORIES - El Segundo, CA
President 02/99-Present
Vice President/General Manager 02/89-01/99
Manage and supervise approximately 25 engineers and technicians performing a variety of analytical services and failure analysis. Provide metallurgical consultation, perform failure analysis and serve as expert witness in product liability trials involving materials failures.

SCANNING ELECTRON ANALYSIS LABORATORIES, INC. - Los Angeles, CA
Manager, Metallurgy and Materials Science 01/85-01/89
Manager, Metallurgical Services 01/80-12/84
Provide metallurgical consultation to customers, including materials analysis, failure analysis, production problem solving, materials selection, and forensic studies. Provide consultation to attorneys for lawsuits involving product liability, product defect and failure analysis.

HUGHES AIRCRAFT COMPANY - Culver City, CA
Group Head, Materials Failure Analysis 1978-80
Responsible for metallurgical failure analysis of electronic components and devices, metallurgy/materials related consultations on various programs, and problem solving support to prevent manufacturing line stoppage. In-charge of the metallurgical failure analysis/metallography laboratory and the supervision of engineers and technicians in the group.

ROCKWELL INTERNATIONAL, B-1 DIVISION - Los Angeles, CA
Member of Technical Staff 1976-78
Performed failure analysis of failed components and structures of the B-1 bomber aircraft during the R & D testing and flight testing, using advanced analytical techniques.

UNIVERSITY OF CALIFORNIA AT LOS ANGELES - Los Angeles, CA
Post-doctoral Research Fellow 1974-76
Performed research on the following projects:

1. Effect of silicon and manganese on the oxidation behavior of Fe-14Cr-14Ni alloy.

2. Development of Mg-Alloy hydrides for use as a possible source for hydrogen powered automobiles.

PROFESSIONAL SOCIETIES - AFFILIATIONS:

ASM International (formerly American Society for Metals)
The Minerals, Metals & Materials Society (TMS)
Institute of Electrical and Electronics Engineers (IEEE)
International Society for Hybrid Microelectronics (ISHM)
American Society for Testing and Materials (ASTM)
Independent Metallurgical Engineering Consultants of California (IMECA)
ASM International - Los Angeles, Chapter Chairman (1989-90); WESTEC Conference Program Committee (1981-89); WESTEC Conference Programming Chairman (1989)

EDUCATION:

Ph.D. 1974 Engineering (Metallurgy and Metal Processing, Minors: Science of Materials and Corrosion): UNIVERSITY OF CALIFORNIA, Los Angeles

M.S. 1971 Engineering (Metallurgy and Metal Processing): UNIVERSITY OF CALIFORNIA, Los Angeles

B.E. 1969 Metallurgical Engineering: UNIVERSITY OF ROORKEE, India (Hons.)

B.Sc. 1965 Physics, Chemistry and Math: UNIVERSITY OF LUCKNOW, India

TEACHING RELATED EXPERIENCE:

Instructor, "Electron Microscopy in Failure Analysis"; A short course organized by ASM International, SINCE 1984.

Education Chairman, Los Angeles chapter, ASM International, 1985-87.

Technical Reviewer, ASM International's Education Course "Principles of Failure Analysis," 1995.

Invited Lecturer, University of California, Los Angeles; University of Southern California; Don Bosco Technical Institute.

PUBLICATIONS:

Kumar, A., D. Rajdev, and D. L. Douglass, "Effect of Oxide Defect Structure on the Electrical Properties of ZrO_2," Journal of American Ceramic Society, 55, No. 9, pp. 439-445, September 1972.

Kumar, A., M. Nasrallah, and D. L. Douglass, "The Effect of Yttrium and Thorium on the Oxidation Behavior of Ni-Cr-Al Alloys," Oxidation of Metals, 8, No. 4, pp. 227-263, August 1974.

Kumar, A., and D. L. Douglass, "Modification of the Oxidation Behavior of High-Purity Austenitic Fe-14Cr-14Ni Alloy by the Addition of Silicon," Oxidation of Metals, 10, No. 1, pp. 1-22, January 1976.

Young, J. D., and A. Kumar, "Use of Laboratory Failure Simulation Exemplars to Study the Intergranular Fracture Modes in 9Ni-4Co- 0.20C Steel," Fractography in Failure Analysis, ASTM STP 645, American Society for Testing and Materials, pp. 32-47, July 1978.

Kumar, A., "Failure Analysis of Electronic Component Leads," Proceedings of ATFA `79, Advanced Techniques in Failure Analysis, pp. 28-33, October 1979.

Kumar, A., "Case Histories of Metallurgical Failures in Electronics Industry," Fracture and Failure: Analyses, Mechanisms and Application, Proceedings of the ASM 1980 WESTEC Sessions on Failure Analysis, pp. 147-164, 1981.

Cozzolino, M. J., G. J. Ewell, and A. Kumar, "Solder Coating of Ceramic Capacitors; Wettability Problems," Proceedings of ISTFA `81, International Society for Testing and Failure Analysis, pp. 111-116, October 1981.

Kashar, L., A. Kumar, and J. M. Patterson, "Use of Microanalytical Techniques in PC Board Failure Analysis," Proceedings of the 27th National SAMPE Symposium, pp. 720-728, May 1982.

Kashar, L., and A. Kumar, "Advances in Microanalysis Using the SEM/EDX System," Proceedings of ISTFA '82, International Society for Testing and Failure Analysis, pp. 314-321, October 1982.

Kumar, A., T. Parsons, and D. Dennies, "Surface Analysis of Thin Oxide Films on a Stainless Steel," Proceedings of ISTFA '84, International Society for Testing and Failure Analysis, pp. 322- 328, October 1984.

PUBLICATIONS (Cont'd):

Kumar, A., "Fracture Behavior and Mechanical Property Relationship of Cast C90300 Copper Alloy", Proceedings of ISTFA '85, International Society for Testing and Failure Analysis, pp. 268-275, October 1985.

Kumar, A., and L. Kashar, "Use of Secondary Ion Mass Spectrometry (SIMS) in Microelectronics Failure Analysis", Proceedings of the 5th Annual Test and Measurement World Expo, pp. 381-391, April 1986.

Neff, M., and A. Kumar, "Localized Hydrogen Attack in a Welded Commercially Pure Titanium Cathode", Proceedings of ISTFA '86, ASM International, pp. 245-250, October 1986.

Kashar, L., A. Kumar, S. Sheybany, M. Neff, and L. Barnard, "Quantitative Analysis of Thin Layers Using Microanalytical Techniques", Proceedings of ISTFA '86, ASM International, pp. 5-10, October 1986.

Kumar, A., and C. Dyer, "Characterization of Surface Treated 316L Stainless Steel Tubings to Prevent Contamination in Gas Distribution Systems", Solid State Technology, pp. 89-94, February 1987.

Kumar, A., "Aircraft Component Failure Investigation Using Advanced Analytical Techniques", Proceedings of Aviation Insurance Association (AIA), pp. 1-7, May 1992.

Kumar, A., and S. Ensha, "Premature Torquing Failure of Cast A356 Aluminum Actuators", Handbook of Case Histories in Failure Analysis, ASM International, Vol. 1, pp. 47-50, 1992.

Kumar, A., and J.O. McClain, Jr., "Improving Device Reliability Through Residual Gas Analysis (RGA)", Proceedings of RL/NIST Workshop on Moisture Measurement and Control for Microelectronics, pp. 185-193, April 1993.

Kumar, A., “Use of Advanced Microanalytical Techniques for Materials Failure Analysis in Microelectronics,” Proceedings of International Conference on Emerging Microelectronics and Interconnection Technologies, ISHM, pp. 407-411, February, 1996.

Kumar, A., “Metallurgical Techniques for Aircraft Component Failure Analysis,” Aviation Litigation News, American Bar Association, Vol. VII, No. 1, pp. 7-10, April 1996.

Kumar, A., and M. Carreon, “Residual Gas Analysis as a Failure Analysis Tool for Microelectronics Devices,” Wescon 96 Conference Proceedings, pp. 114-115, October 1996.

Kumar, A., “Use of SEM in Aircraft Component Failure Analysis,” Proceedings of Microscopical Society of Canada, Vol. 24, pp. 18-19, June 1997.

PUBLICATIONS (Cont'd):

Kumar, A., and J. A. Hess, "Residual Gas Analysis (RGA) of Microelectronic Packages Containing Silicone," Proceedings of Second International Conference on Emerging Microelectronics and Interconnection Technologies – EMIT '98, IMAPS, pp. 188-191, February 1998.

Armstrong, R.W., J. Mason, A. Kumar, and J.E. Hall, "Thermally Induced Failure of Low-Voltage Electrical Nonmetallic-Sheathed Cable Insulation," Fire Technology, National Fire Protection Association, pp. 263-275, August 1999.

BOOKS:

Co-editor, Fracture and Failure: Analyses, Mechanisms and Applications, Proceedings of the ASM-1980, WESTEC Session on Failure Analysis, American Society for Metals, 1981.

Co-author, Chapter on "Use of Microanalytical Techniques in Failure Analysis and Problem Solving", Metals Handbook, Ninth Edition, Volume 11, Failure Analysis and Prevention, American Society for Metals, November 1986.

Co-author, Chapter on "Failure Mechanisms in Printed Wiring Boards", Electronic Materials Handbook, Volume 1, Packaging, ASM International, 1989.

Reviewer, Chapter on "Failure Analysis", Composites, Vol. 21, ASM Handbook, ASM International, 2001.

PATENT:

"Method of Increasing the Fatigue Life of Titanium Alloy Parts," U.S. Patent No. 4,287,740 issued September 8, 1981.