

CURRICULUM VITAE OF BINOD KUMAR

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BUSINESS EXPERIENCE:

January 1980 to Date UNIVERSITY OF DAYTON
Dayton, OH
UNIVERSITY OF DAYTON RESEARCH INSTITUTE (UDRI)
Group Leader / Distinguished Research Engineer
Manage and coordinate research and development programs on lithium rechargeable batteries, fuel cells, electrochemistry, and electronic materials. Initiated and developed sponsored research programs on thin film optical devices, superconductivity, biomaterials, batteries, and fuel cells (>\$10 x 10⁶).
SCHOOL OF ENGINEERING
Professor, Mechanical and Aerospace Engineering
Advise and support graduate students (Ph.D. and M.S.). Mentored 20 students. Published over 120 papers and ten patents. Developed the field of heterogeneous electrolytes and materials for applications in emerging rechargeable lithium batteries and fuel cells.

EDUCATION:

1976-1979 Completed Anchor Hocking's internal courses on Management Systems I and II courses.
1973-1976 The Pennsylvania State University
Ph.D. in Ceramic Science and Engineering
Thesis: Phase Separation Characteristics of Soda-Lime-Silica Glass as Related to Melting History
1971-1973 The Pennsylvania State University
M.S. in Ceramic Science and Engineering
Thesis: Strength and Related Characteristics of Lithium Silicate Glasses Crystallized After Ion Exchange
1963-1967 Banaras Hindu University, Varanasi, India
B.Sc. Tech. Ceramic Engineering
Thesis: Design of a 7 Ton Capacity Glass Tank Furnace:

SOCIETIES AND ORGANIZATIONS:

American Ceramic Society, Electrochemical Society, National Institute of Ceramic Engineers, Indian Ceramic Society, and Keramos Honor Fraternity.

PUBLICATIONS AND PRESENTATIONS:

Published over 120 publications in refereed journals and proceedings. Presented numerous invited papers at national and international conferences and research organizations.

CONSULTATIONS:

Provided consulting services to Zimmer, Inc., Mead Corporation, Quantronix, Inc., Orthomatrix, Inc., and Jafe Decorating Co.

LIST OF RECENT REFEREED PUBLICATION

1. "Ionic Conduction Through Heterogeneous Solids: Delineation of Blocking and Space Charge Effects," B. Kumar, S. Nellutla, J. S. Thokchom and C. Chen, *J. Power Sources* 160(2), 1329-1335(2006).
2. "Ionically Conducting Composite Membranes from the $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{TiO}_2-\text{P}_2\text{O}_5$ Glass-Ceramic," J. S. Thokchom and B. Kumar, *J. Amer. Ceram. Soc.* 90 (2), 462-466 (2007).
3. "Ionic Conductivity of Scandia-Stabilized Zirconia and Alumina Composites," B. Kumar and C. Chen, *Trans. Indian Ceramic Society* 66 (1), 17-22 (2007).
4. "Water Durable and Mechanically Resilient Lithium Ion Conducting Membranes from the $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{TiO}_2-\text{P}_2\text{O}_5$ Glass-Ceramic and Its Composite with Polyethylene," J.S. Thokchom and B. Kumar, *J. Electrochem. Soc.* 154 (4), A331-A336 (2007).
5. "Ionic Transport through Heterogeneous Solids," B. Kumar, *Trans. of the Indian Ceramic Society*, 66(3) 123-130 (2007).
6. "Space Charge Signature and Its Effect on Ionic Transport in Heterogeneous Solids," *J. Amer. Ceram. Soc.*, 90(10) 3323-25(2007).
7. "Space Charge Mediated Ionic Transport in Yttria Stabilized Zirconia- Alumina Composite Membranes", B. Kumar and J. S. Thokchom, *J Amer. Ceram. Soc.* (in press).
8. "Heterogeneous Electrolyte Based Direct Oxidation Solid Oxide Fuel Cells", B. Kumar and J. S. Thokchom, *J. Power. Sources.* (in press).
9. "Heterogeneous Electrolytes: Variables for and uncertainty in Conductivity measurements" B. Kumar, *J. Power Sources* (in press).

PATENTS

1. "Segmented YAG (yttrium aluminum garnet) laser rods and methods of manufacture," U.S. 4,507,787, issued 26 March 1985.
2. "Bioabsorbable glass for use in the reinforcement of bioabsorbable polymers for reconstruction of ligaments and tendons," U.S. 4,604,097, issued 5 August 1986.
3. "Fast Ion Conductors," U.S. 5,352,544, issued 4 October 94.
4. Ceramic-Polymer Composite Electrolytes for Solid State Batteries, U.S. 5,695,873, issued 9 December 1997.
5. "Solid Composite Electrolytes for Lithium Batteries," U.S. 6,132,905, issued 17 October 00.
6. "Solid Electrolytes for Lithium Batteries," U.S. 6,190,806, issued 20 February 01.

7. "Resistors formed of Aluminum Titanium Alloys," U.S. 6,538,554 B1, issued 25 March 2003.
8. "Methods of Enhancing Conductivity of a Polymer-Ceramic Composite Electrolyte," U.S. 6,656,641, issued 2 December 03.
9. "Colloidal Electrolytes," U.S. 6,986,970 B1, issued 17 January 06.
10. "Ceramic-Ceramic Nanocomposites for Oxygen Ion Conductors," patent application filed December 17, 2004.
11. "Colloidal Electrolytes-Processing," patent application pending.
12. "Polymer-Ceramic Composite, Water Impermeable Lithium Ion Conducting Membrane and Method of Making," provisional patent application filed 21 November 2005.