

# WILLIAM T. PETUSKEY

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**SPECIALTY** *Chemistry of Materials: physical chemistry, ceramic materials, glass-ceramic nanocomposites. magnetic nanoferrites, electrical ceramics, chemical vapor deposition, low temperature synthesis of dense and nanoporous oxides*

**EDUCATION** *Massachusetts Institute of Technology*  
Sc.D. Ceramic Science; Advisor: Prof. H. Kent Bowen 1973-1977  
*University of Utah*  
B.S., Materials Science and Engineering 1969-1973

## PROFESSIONAL EMPLOYMENT

### *Arizona State University*

#### *Knowledge Enterprise Development*

Director, Advanced Materials Initiative 2016-present  
Associate Vice President, Science, Engineering and Technology 2012 – 2016  
*Department of Chemistry & Biochemistry (now School of Molecular Sciences)*  
Chairman 2006 – 2012  
Associate Chairman 2002 – 2006  
Professor 1996 – present  
Assistant Chairman 1986 – 1990  
Associate Professor 1983 – 1996  
*School of Materials, Professor* 2006 – 2010  
*Science and Engineering of Materials Graduate Program, Co-Director* 1998 – 2006

### *Tokyo Institute of Technology*

*Research Laboratory of Engineering Materials, Guest Professor* 1990 – 1991

### *University of Illinois at Urbana/Champaign*

*Department of Ceramic Engineering, Assistant Professor* 1978 – 1983

### *Technischen Universität Hannover (now Universität Hannover, Germany)*

*Institut für Physikalische Chemie und Elektrochemie, Postdoctoral Fellow* 1977 – 1978  
Supervisor: Prof. Dr. H. Schmalzried

*Massachusetts Institute of Technology, Research Assistant* 1973 – 1977

*University of Utah, Research Assistant* 1969, 1972 – 73

## PROFESSIONAL AND HONORARY SOCIETIES

*AAAS, American Ceramic Society, American Chemical Society, Royal Society of Chemistry, Tau Beta Pi, Keramos*

## Publications of WILLIAM T. PETUSKEY

- "Chemical Stability and Degradation of MHD Electrodes," H. K. Bowen, J. W. Halloran, W. T. Petuskey, J. B. See and D. Lynch, Proc. on the 14th Symp. on Engineering Aspects of Magnetohydrodynamics, April 8-10, 1974, University of Tennessee, Tullahoma, Tenn.
- "Chemical Stability and Degradation of MHD Electrodes," H. K. Bowen, J. W. Halloran and W. T. Petuskey, Corrosion Problems in Energy Conversion and Generation, Electrochem. Soc. Publications, C. S. Tedmon, Jr. (ed.), pp. 179-221 (1974).
- "Properties and Thermochemical Stability of Ceramics and Metals in Open- Cycle Coal Fired MHD System," T. O. Mason, W. T. Petuskey, W. W. Liang, J. W. Halloran, F. Yen, T. M. Pollak, J. F. Elliott, and H. K. Bowen, Proc. of the 6th International Conf. MHD Electrical Power Generation, Washington, D.C., June 9-13, 1975, Vol. II.
- "Ionic Transport in PbO-SiO<sub>2</sub> Melts (II): Transfer Measurements Using Galvanic Cells," W. T. Petuskey and H. Schmalzried, Ber. Bunsenges. Phys. Chem., **84**, 218-222 (1980).
- "Phase Equilibria in the Fe-Al-O System," C. Meyers, T. O. Mason, W. T. Petuskey, J. W. Halloran, and H. K. Bowen, J. Am. Ceram. Soc., **63** [11-12] 659-663 (1980).
- "Electrochemical Transport in Molten Lead Silicates," W. T. Petuskey, Can. Metal. Quart., **20** [2] 225-230 (1981).
- "Thermal Segregation in Iron Aluminate Spinels," W. T. Petuskey and H. K. Bowen, J. Am. Ceram. Soc., **64** [10] 611-617 (1981).
- "Enhanced Oxygen Diffusion at 1400°C in Deformed Single-Crystal Magnesium Oxide," A. F. Henriksen, Y. M. Chiang, W. T. Petuskey and W. D. Kingery, J. Am. Ceram. Soc., **66** [8] C144-146 (1983).
- "Diffusion Analysis Using Secondary Ion Mass Spectroscopy (SIMS)," W. T. Petuskey, Nontraditional Methods in Diffusion, G. E. Murch, H. K. Birnbaum, and J. R. Cost (eds.), AIME publication, New York, pp. 179-202 (1984).
- "Secondary-Ion Mass Spectrometric Analysis of Oxygen Self-Diffusion in Single Crystal MgO," Han-Il Yoo, B. J. Wuensch and W. T. Petuskey, Advances in Ceramics, v. 10: Structure-Property Relationships for MgO and Al<sub>2</sub>O<sub>3</sub> Ceramics, American Ceramic Society Publication, Columbus, OH, pp. 394-405 (1984).
- "Current Induced Segregation in Ionic Melts," W. T. Petuskey, J. Am. Ceram. Soc., **68** [2] 86-92 (1985).
- "Chemical Vapor Deposition of SiC from Si-C-Cl-H<sub>2</sub> Gas System: Thermochemical Calculations and Kinetic Implications," G. S. Fischman and W. T. Petuskey, J. Am. Ceram. Soc., **68** [4] 185-190 (1985).
- "Solidification Microstructures of Laser Melted Alumina Powder Compacts," D. H. Matthiesen and W. T. Petuskey, J. Am. Ceram. Soc., **68** [5] C114-116 (1985).

- "Suppression of Insulator Charging During Secondary-Ion Mass Spectroscopy and Scanning Electron Microscopy," E. Giraldez, L. Dolhert, W. D. Kingery and W. T. Petuskey, J. Am. Ceram. Soc., **68** [10] C286-287 (1985).
- "Cultural Resource Monitoring: Concurrent Aerometric and Materials Deterioration Studies at Mesa Verde National Park," D. A. Dolske and W. T. Petuskey, Materials Degradation Caused by Acid Rain, ACS Symposium Series, 318, R. Baboian (ed.), American Chemical Society (1986)
- "Interfacial Effects on Nonstoichiometry in Ag<sub>2</sub>S/Al<sub>2</sub>O<sub>3</sub> Composites," W. T. Petuskey, Solid State Ionics, **20**, 117-129 (1986)
- "Structural Aspects of Bonding in Silicon Carbide Polytypes: *ab initio* MO Calculations," J. Guth and W. T. Petuskey, J. Phys. Chem. Solids, **48** [6] 541-549 (1987)
- "<sup>29</sup>Si MAS-NMR Characterization of SiC Polytypes," J. R. Guth and W. T. Petuskey, J. Phys. Chem., **91**, 5361-64 (1987)
- "Scanning Tunneling Microscopy of β-SiC and YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7-x</sub> Ceramic Surfaces," N. J. Zheng, U. Knipping, W. T. Petuskey, J. C. Barry and I.S.T. Tsong, J. Vac. Sci. Technol., **A6**, 457-460 (1988).
- "Scanning Tunneling Microscopy of Cubic Silicon Carbide Surfaces," N. J. Zheng, U. Knipping, I. S. T. Tsong, W. T. Petuskey, H. S. Kong and R. F. Davis, J. Vac. Sci. Technol., **A6**, 696-8(1988).
- "Electrochemical Behavior of Platinum and Iridium Electrodes in 2PbO·SiO<sub>2</sub> Melts," A. Nishikata and W. T. Petuskey, J. Electrochem. Soc., **136**[6]1720-26(1989).
- "The Low-Temperature Structure of Magnetite Studied by CBED," J. M. Zuo, J.C.H. Spence and W. Petuskey, Proc. XIIth International Congress for Electron Microscopy, San Francisco Press (1990), 508-9.
- "A Valence Force Field for Diamond from *ab initio* Molecular Orbital Cluster Calculations," J. R. Guth, A. C. Hess, P. F. McMillan and W. T. Petuskey, J. Phys.: Condens. Matter, **2**, 8007-8014(1990).
- "Charge Ordering in Magnetite at Low Temperatures", J. M. Zuo, J.C.H. Spence and W. T. Petuskey, Phys. Rev. B, **13**, 8451-8464 (1990).
- "Chemical Synthesis of Aluminum Nitride Powders", P. R. Coffman, W. T. Petuskey and S. K. Dey, Better Ceramics Through Chemistry, IV, C. J. Brinker, D. E. Clark, D. R. Ulrich and B.J.J. Zelinski (eds.) Mat. Res. Soc. Symp Proc. (Better Ceramics Through Chemistry, IV), v180 (1990) pp. 709-714.
- "Chemical Aspects of Pb-Zr-Ti Oxide Thin Film Synthesis by PE-MOCVD Below 500°C," W. T. Petuskey, D. A. Richardson and S. K. Dey, Proc. 3rd International Symp. on Integrated Ferroelectrics, Colorado Springs, Colorado, (1991) pp. 571-597.
- "Impacts of Microclimate and Air Quality on Sandstone Masonry of Anasazi Dwelling Ruins at Mesa Verde National Park," D. A. Dolske, W. T. Petuskey and D. A. Richardson, Proceedings of the Anasazi Symposium 1991, Mesa Verde National Park, J. Smith and A. Hutchinson (eds.), Mesa Verde Museum Association, Library of Congress Cat. No. 93-080585, (1991).

- "An Hypothesis of Anasazi Criteria for Selecting Sandstone Masonry," D. A. Dolske, W. T. Petuskey and D. A. Richardson, Proceedings of the Anasazi Symposium 1991, Mesa Verde National Park, J. Smith and A. Hutchinson (eds.), Mesa Verde Museum Association, Library of Congress Cat. No. 93-080585, (1991).
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- "Deposition and Characterization of Thin Film Ferroelectric PZT Phases by Plasma Assisted CVD," D. A. Richardson, C. J. Kuo, W. T. Petuskey and S. K. Dey, Ceramic Transactions (Ferroelectric Films), vol. 25, A. S. Bhalla and K. M. Nair (eds.), American Ceramic Society (1992) pp.195-202.
- "Phase Relationships in the Ti-Si-C System at High Pressures," S. Sambasivan and W. T. Petuskey, J. Mat. Res., 7 [6]1473-79(1992).
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- "Energetics and Electronic Structure of the Hypothetical Cubic Zincblende Form of GeC," O. F. Sankey, A. A. Demkov, W. T. Petuskey and P. F. McMillan, Modeling Simul. Mater. Sci. Eng., 1, 741-754 (1993).
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- "A Structural Investigation of CaO-Al<sub>2</sub>O<sub>3</sub> Glasses via <sup>27</sup>Al MAS NMR", P. F. McMillan, W. T. Petuskey, B. Coté, D. Massiot, C. Landron, J.-P. Coutures, J. Non-Crystalline Solids, 195[3]261-271(1996).

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- "High Pressure, High-Temperature Synthesis and Characterization of Boron Suboxide (B<sub>6</sub>O)," H. Hubert, L.A.J. Garvie, B. Devouard, P. R. Buseck, W. T. Petuskey and P. F. McMillan, Mat. Res. Soc. Symp. Proc., 410, 191-196 (1996).
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- "Icosahedral packing of B<sub>12</sub> icosahedra in boron suboxide (B<sub>6</sub>O)," H. Hubert, B. Devouard, L. A. J. Garvie, M. O'Keeffe, P. R. Buseck, W. T. Petuskey & P. F. McMillan, Nature, 391, 376 (1998).
- "Reply to 'Comment on New Ternary Nitride in the Ti-Al-N System'," Hee Dong Lee and William T. Petuskey," J. Am. Ceram. Soc., 81[3]787-88(1998).
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- "High-Pressure, High -Temperature Synthesis and Characterization of Boron Suboxide (B<sub>6</sub>O)," H. Hubert, L. Å. J. Garvie, B. Devouard, P. R. Buseck, W. T. Petuskey and P. F. McMillan, Chem. Mater., 10[6]1530-1537(1998).
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- "High Pressure Synchrotron Diffraction of KCa<sub>2</sub>Nb<sub>3</sub>O<sub>10</sub>, A Layered Perovskite Compound," K. A. Steiner and W. T. Petuskey, in Application of Synchrotron Radiation Techniques to Materials Science, S. M. Mini, S. R. Stock, D. L. Perry, & L. J. Terminello (eds.), Materials Research Society Symposium Series, 524, 133-137, (1998).

- “Thermoelastic Properties of Layered Perovskites: A Non-empirical Density Functional Theory Approach,” A.V.G. Chizmeshya and W. T. Petuskey, in High Temperature Ceramics: Experiment and Theory, A. Pechenik, P. Vashishta and R. Kalia (eds.), Oxford University Press, Oxford, 1999, pp. 504-518.
- “Layered Perovskites as ‘Soft-Ceramics’,” G. Fair, M. Shemkunas, W. T. Petuskey, and S. Sambasivan, J. Eur. Ceram. Soc., 19, 2437-2447 (1999).
- “Nucleation and Growth of Icosahedral Boron Suboxide Clusters at High Pressure,” P. F. McMillan, H. Hubert, A. Chizmeshya, W. T. Petuskey, L.A.J. Garvie and B. Devouard, J. Solid State Chemistry, 147, 281-290 (1999).
- "Phase Equilibria in the Lead-Magnesium-Niobium-Oxygen System at 1000°C," P. Lucas and W. T. Petuskey, J. Am. Ceram. Soc., 84 [9] 2150-52 (2001).
- "Rapid Synthesis of Crystalline Spinel Tin Nitride by a Solid-State Metathesis Reaction," M. Shemkunas and W. T. Petuskey, J. Am. Ceram. Soc., 85 [1] 101-104 (2002).
- “Oxygen self-diffusion in single-crystal MgO: secondary-ion mass spectrometric analysis with comparison of results from gas-solid and solid-solid exchange ,” Han-Il Yoo, Bernhardt J. Wuensch, and William T. Petuskey, Solid State Ionics (2002), 150 [3,4] 207-221 (2002).
- "Hardness, elasticity, and fracture toughness of polycrystalline spinel germanium nitride and tin nitride," M. P. Shemkunas, W. T. Petuskey, A.V.G. Chizmeshya, K. Leinenweber, and G. H. Wolf, J. Mater. Res. 19 [5] 1392-1399 (2004)
- "Melt structure in the Al<sub>2</sub>O<sub>3</sub>-CaO-LaPO<sub>4</sub> system studied by Raman scattering and ultra high-temperature <sup>27</sup>Al NMR," J. Piwowarczyk, R.F. Marzke, B.H. Takulapalli, G.H. Wolf, P.F. McMillan and W.T. Petuskey, J. Eur. Ceram. Soc., 25 [8] 1333-1340 (2005).
- “Phase Equilibria of the Lead-Magnesium-Titanate, and Lead-Niobium-Titanate Systems at 1000°C and 1 atm,” Robert Mangham and William T. Petuskey, Ceramic Transactions, 169(Synthesis, Properties, and Crystal Chemistry of Perovskite-based Materials). Winnie Wong-Ng, Amit Goyal, Ruyan Guo, Amar S. Bhalla (eds.), American Ceramic Society, 139-149 (2005).
- “High Temperature Phase Equilibria of the Magnesium-Niobium-Titanate System,” Robert Mangham and William T. Petuskey, J. Am. Ceram. Soc., 88 [11] 3192-3197 (2005).
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- “Cover Picture: Influence of Plasma Stimulation on Si Nanowire Nucleation and Orientation Dependence,” Advanced Materials and Processes, 19[18] Cover Page (2007).
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28[12]2421-2431(2008).

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“Low temperature mullite crystallization in Al- and Si-alkoxide derived homogeneous gels,” Feng He and William T. Petuskey, *Materials Letters*, 63, 2631-2634 (2009).

“Template-Directed Nucleation and Growth of Inorganic Nanoparticles on DNA Scaffolds,” Linda A. Stearns, Rahul Chhabra, Jaswinder Sharma, Yan Liu, William T. Petuskey, Hao Yan, and John C. Chaput, *Angewandte Chemie International Edition*, 48[45]8494-8496(2009).

“On Direct Observation of Diffusion by Aberration-Corrected HREM,” JT McKeown, Y-W Kim, WT Petuskey, M O’Keeffe, U Weierstall and JCH Spence, *Microscopy and Microanalysis*, 16(Suppl. 2), pp 134-135 (2010). doi:10.1017/S1431927610059970

“Mechanical Properties of Titanium Nitride Nanocomposites Produced by Chemical Precursor Synthesis Followed by High-P,T Treatment,” Edward Bailey, Nicole M. Thompson, Andrew L. Hector, Peter Crozier, William T. Petuskey, and Paul F. McMillan, *Materials*, 4, 1747-1762 (2011)

“Cell Assemblies for Reproducible Multi-Anvil Experiments (the COMPRES assemblies),” Leinenweber, K. D., Tyburczy, J. A., Sharp, T. G. , Soignard, E., Diedrich, T., Petuskey, W. B. (sic), Wang, Y. B., *American Mineralogist*, 67 [2-3] 353-368 (2012).

“Magnetic Domain Structure in Nanocrystalline Ni-Zn-Co Spinel Ferrite Thin Films,” D. Zhang, N. M. Ray, W. T. Petuskey, D. J. Smith and M. R. McCartney, *Journal of Applied Physics*, 116, 083901 (2014) <http://dx.doi.org.ezproxy1.lib.asu.edu/10.1063/1.4891723>

“Growth morphologies, fragmentation patterns, and hardness in sodium hydrogen urate monohydrate,” A.B. Brune and W. T. Petuskey, *Materials Research Society Symposium Proceedings*, 1721, 7-12 (2015). <https://www-scopus-com.ezproxy1.lib.asu.edu/record/display.uri?eid=2-s2.0-84938094437&origin=inward&txGid=9787BEC5912D5DC96A7B96211FF145CD.wsnAw8kcdt7IPYLO0V48gA%3a1>

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12/31/2016

## Recent Patent Activity

William T. Petuskey

2/12/2017

### Patents Awarded

#### **Solid state sensor for detection of explosives**

**Patent number:** 9535046

**Abstract:** Functionalized titanium nanotubes can be utilized to detect compounds of interest, for example peroxide-based explosives. The nanotubes may desirably be coated, for example with a silicon oxynitride coating, in order to improve detection performance and/or functionality in the presence of moisture, saline, or other conditions typically unfavorable to titanium nanotube detection devices and methods. Inexpensive, compact, reusable, and responsive sensors may be fabricated from the coated nanotubes.

**Type:** Grant **Filed:** November 26, 2013 **Date of Patent:** January 3, 2017

**Assignee:** Arizona Board of Regents on behalf of Arizona State University

**Inventors:** Indu B. Mishra, William T. Petuskey

#### **Nanoferrite flakes**

**Patent number:** 9324484

**Abstract:** A ferrite layer having a columnar structure is formed, and ferrite flakes are separated from the ferrite layer. The ferrite flakes include a metal oxide having a spinel cubic crystal structure with a stoichiometry represented by  $AB_2O_4$ , where A and B represent different lattice sites occupied by cationic species, and O represents oxygen in its own sublattice.

**Type:** Grant **Filed:** February 6, 2014 **Date of Patent:** April 26, 2016

**Assignee:** Arizona Board of Regents for and on behalf of Arizona State University

**Inventors:** Nicole M. Ray, William T. Petuskey

### Patenting Activity

#### **SOLID STATE SENSOR FOR DETECTION OF EXPLOSIVES**

**Publication number:** 20150285773 **Abstract:** Functionalized titanium nanotubes can be utilized to detect compounds of interest, for example peroxide-based explosives. The nanotubes may desirably be coated, for example with a silicon oxynitride coating, in order to improve detection performance and/or functionality in the presence of moisture, saline, or other conditions typically unfavorable to titanium nanotube detection devices and methods. Inexpensive, compact, reusable, and responsive sensors may be fabricated from the coated nanotubes.

**Type:** Application **Filed:** November 26, 2013 **Publication date:** October 8, 2015

**Inventors:** Indu B. Mishra, William T. Petuskey



## THIN FILM FERRITE LAMINATION

**Publication number:** 20140302344 **Abstract:** Forming a ferrite thin film laminate includes heating a layered assembly to form a laminate. The layered assembly includes a first coated substrate having a first ferrite layer opposite a first thermoplastic surface and a second coated substrate having a second ferrite layer opposite a second thermoplastic surface to form a laminate. Each coated substrate is formed by forming a ferrite layer on a surface of a thermoplastic substrate. The coated substrates are arranged such that the first ferrite layer contacts the second thermoplastic surface. Heating the layered assembly includes bonding the first coated substrate to the second coated substrate such that the first ferrite layer is sandwiched between a first thermoplastic substrate and a second thermoplastic substrate. The ferrite thin film laminate may include a multiplicity of coated substrates.

**Type:** Application **Filed:** October 26, 2012 **Publication date:** October 9, 2014

**Inventors:** William T. Petuskey, Nicole M. Ray

**NANOFERRITE FLAKES** **Publication number:** 20140264145 **Abstract:** A ferrite layer having a columnar structure is formed, and ferrite flakes are separated from the ferrite layer. The ferrite flakes include a metal oxide having a spinel cubic crystal structure with a stoichiometry represented by  $AB_2O_4$ , where A and B represent different lattice sites occupied by cationic species, and O represents oxygen in its own sublattice.

**Type:** Application **Filed:** February 6, 2014 **Publication date:** September 18, 2014

**Inventors:** Nicole M. Ray, William T. Petuskey