**CURRICULUM VITAE**

ZHIGANG ZAK FANG

**Professor**

Dept. of Materials Science and Engineering

University of Utah e-mail: zak.fang@utah.edu

**Highlights of Professional Achievements and Reputation**

* Strong and continuing government and industry-supported research programs:

**Total to date ~$33MM from 2002-2034**

* PI and Director of six large DOE-funded multi-investigator programs. Total ~ $15MM.
* Humboldt Research Award
* R&D 100 Award 2009 and 2023 for tungsten carbide and titanium, respectively.
* Program Director, USDOE Advanced Research Project Agency-Energy (ARPA-E), 2019-2022
* Fellow, National Academy of Inventors.
* Fellow, American Society of Metals (ASM) International
* Fellow, American Powder Metallurgy Institute (APMI) International
* Editor-in-Chief, Int. J. Refractory Metals and Hard Materials, Elsevier
* #1 and #7 most cited articles in Int. Journal of Refractory Metals and Hard Materials (as of 2017)
* MPIF Distinguished Service Award
* Utah Innovations Award 2018 and 2010
* Univ. of Alabama at Birmingham Eng. Alumni, “40 Engineers Making A Difference” Award, 2011
* Teaching award, Dept. of Met. Eng., 2004/05
* Total 350 publications and patents, including approximately 184 in peer-reviewed journals.
* Google Scholar metrics (January 24, 2024): citations 11078, h-index 56, i10-index 158.
* Book: **Extractive Metallurgy of Titanium**, Elsevier Publishing, 2018
* Book: ***Sintering of Advanced Materials***, Elsevier/Woodhead Publishing, U.K., 2010.
* Notable invited/keynote lectures: Keynote Address (Powder Metallurgy and Additive Manufacturing of Titanium, Montreal, Canada August 29, 2022); MIT Invited Seminar Speaker (November 2019;) Plenary Speaker (Fourth Int’l PM Ti 2017, Xi’an), Powder Metallurgy World Congress 2016 (Hamburg, Germany); Plenary Speaker (ISNNM 2016, Budapest Hungary); Ti Round Table 2016 (Hokkaido, J.P.); Third PM Ti 2015 (Luneburg, Germany); TMS 2015, Plenary on Light Metals (Orlando, FL); Sintering 2014 (Dresden, Germany), Metal-Hydrogen System 2014 (Manchester, U.K.), Plansee Seminar 2013 (Keynote Address), TMS2013 Cost Affordable Ti Symposium, PM Ti Australia 2011, Sintering 2011, Argonne National Lab 2011, International Ti Association (ITA) 2011, PM World Congress Florence 2010
* Editorial Board, Powder Metallurgy, Manney Publishing.
* Editorial Board, Int. J. of Powder Metallurgy, MPIF Publishing
* Chair (2010-2012), Powder Materials Committee, Division of Structural Materials, TMS
* Invited MRS Symposium Organizer, Hydrogen Storage, and Carbon Capture, MRS Spring, 2011
* Invited Special Program Chair, European Powder Metallurgy Institute, P/M World Congress, 2010, Florence, Italy. “Hard Materials Beyond Conventional Hard Metals”.
* Peer reviewer for multiple federal funding agencies: NSF, DOE, ARO, etc.

**Research Funding Since 2002**



**EDUCATION / PROFESSIONAL PREPARATION**

Ph.D. in Materials Science and Engineering, 1990

University of Alabama at Birmingham, Birmingham, Alabama

M.S. in Materials Science and Engineering, 1985

Beijing University of Iron & Steel Technology (Now USTB), Beijing, China

B.S. in Materials Engineering, 1982

Beijing University of Iron & Steel Technology (Now USTB), Beijing, China

Manufacturing Executive Education Program, 1996 Johnson School of Business, Cornell University

**RESEARCH EXPERIENCE AND EXPERTISE**

**Titanium, Titanium Alloys, Titanium Hydride, and Titanium Dioxide**

* A break through low cost process for production of Ti primary metal
* An innovative process for making spherical Ti alloy powder for 3D printing
* An innovative hydrogen sintering process for manufacturing high performance low cost titanium and titanium alloys

**Cemented Tungsten carbide, polycrystalline diamond, and other hard materials**

* Processing, microstructure, and mechanical properties of cemented tungsten carbide (hard metals)
* Functionally graded cemented tungsten carbide
* Functionally designed polycrystalline diamond composite
* Nano and ultrafine grain hard metals

**Ultrafine/nano grain tungsten and tungsten alloys**

* Synthesis and sintering of nanosized W
* Methods to ductilize W
* Mechanical properties of fine grain and ultrafine grain tungsten
* Process to fabricate bulk ultrafine grain W by sintering nanosize W powder
* Ultrafine grain tungsten for fusion energy systems
* Nano particles interaction, coalescence, sintering, and grain growth

**Metal Hydride for hydrogen storage and thermal energy storage applications**

* Discovery of new metal hydride materials for hydrogen storage
* Thermal energy storage based on metal hydrides

**EMPLOYMENT HISTORY**

2019-2022

**Program Director**

USDOE Advanced Research Project Agency-Energy (ARPA-E)

2002 - Present

University of Utah

**Professor,** Metallurgical Engineering (Associate Prof. 06-10, Assistant Prof. 02-05)

1997 – 2002

**Director, Materials R&D**

Smith Tool, Smith International (Now Schlumberger Inc)

1994 – 1997

**Manager, Materials Research**

Smith Tool, Smith International (Now Schlumberger Inc)

1991 - 1994

**Senior Materials Engineer, R&D**

RTW, Greenfield Industries (Now Kennametal Inc)

1987 - 1990

**Graduate Research Assistant**

University of Alabama at Birmingham

Dissertation: Diffusion controlled coarsening

1986 - 1987

**Research Fellow**

Delft University of Technology, The Netherlands,

1984 - 1986

**Assistant Professor of Powder Metallurgy,**

Beijing University of Iron and Steel Technology (Now USTB), Beijing, China

**HONORS & INVITED ACTIVITIES**

* Humboldt Research Award
* R&D100 Award 2009 and 2023, respectively
* Fellow, National Academy of Inventors, 2017
* Fellow, ASM International, 2014
* Fellow, APMI International, 2013
* Editor-in-Chief, Int. J. of Refractory Metals and Hard Materials
* MPIF Distinguished Service Award
* Utah Innovations Award 2010
* Univ. of Alabama at Birmingham Engineering Alumni, “40 Engineers Making A Difference” award, 2012
* Best Poster Award, Sintering 2011, Jeju Island, Korea
* Teaching Award 2004/2005, Dept. of Metallurgical Engineering, University of Utah
* First Place, ASM International PM Metallographic Contest, 2002

***Invited paper, lectures, presentation, and activities***

* Keynote Speaker – Powder Metallurgy and Additive Manufacturing of Titanium 2022, Montreal, Canada
* Invited Seminar Speaker, Dept of Materials Sci and Eng, MIT, November, 2019
* Keynote Speaker – Powder Metallurgy of Titanium 2017, Xi’an, China
* Keynote Speaker – World PM Congress, 90 Years of Hardmetals Celebration, Hamburg, Germany, October, 2016
* Plenary Speaker – Int. Symp. Novel and Nano Materials 2016, Budapest, Hungary, July 2016
* Invited Speaker – Ti Round Table 2016, Hokkaido, Japan, July 2016,
* Invited Speaker – MS&T 2016, Sintering Symposium, Salt Lake City, UT, USA
* Invited Speaker – Third PM Ti 2015, August 2015, Luneburg, Germany
* Invited Speaker – TMS 2015, Plenary on Light Metals Production, Orlando, Mar. 2015
* Invited Speaker – Sintering 2014, August 2014, Dresden, Germany
* Invited Speaker – Metal-Hydrogen System (MH2014), July 2014, Manchester, U.K.
* Keynote address – 18th Plansee Seminar, June 2013
* Invited Speaker – TMS 2013 Cost Affordable Ti Symposium, San Antonio, March 2013
* Invited Speaker – MS&T 2012 Powder Ti Symposium, Pittsburgh, PA, October 2012
* Invited Speaker – MS&T 2012 Energy Materials Symp. Pittsburgh, PA, October 2012
* Invited speaker – TMS 2012, R. German Honorary Symposium
* Invited speaker – PM Ti Brisbane Australia, December 2011
* Invited speaker – MS&T 2011, K. Chawla Honorary Symposium
* Invited seminar speaker – Argonne National Lab, August 2011
* Invited speaker – Sintering 2011, Jeju, Korea
* Invited speaker – World Congress of Powder Metallurgy 2010, Florence, Italy
* Invited speaker – MS&T 2009, Nano Material Processing Symp., Pittsburgh, PA
* Invited speaker – AsiaNano 2008, Singapore
* Invited speaker – Material Innovation In H2 Economy, Acers, Cocoa Beach, 2008
* Invited speaker – Beijing University of Sci. and Tech, June 2011
* Invited speaker – Kunming University of Sci and Tech, July 2009
* Editor-in-Chief, Int. J. Refractory Metals and Hard Materials
* Editor and Contributor, Sintering of Advanced Materials, Woodhead Publishing, Cambridge, UK, 2010
* Editorial Review Committee, Int. Journal of Powder Metallurgy
* Editorial Board, Powder Metallurgy, Maney Publishing
* NSF Division of Engineering, Committee of Visitors (COV)
* NSF Sustainable Energy Review Panel / Mail, 2007, 2008, 2011
* NSF multiple review panels: 1995, 1996, 2002, 2003, 2006, 2007, 2008, 2009, 2010
* Reviewer: DOE-BES, DOE-NETL, U.S. Army Research Office, and others
* Peer review: multiple international journals: Acta Materialias, Journal of American Chemical Society, Advanced Materials, Advanced Functional Materials, Journal of American Ceramic Society, International Materials Review, J. of Physical Chemistry, J. of Materials Science, J. of Alloys and Compounds, Materials Science and Eng., J. of Materials Eng. And Performance, Int. J. Powder Metallurgy, Chemistry of Materials, In. J of Refractory Metals and Hard Materials, etc.
* Chair, TMS Powder Materials Committee
* Invited Symposium Organizing Chair, Hydrogen Storage and Carbon Capture, MRS Spring Meeting, 2011
* Invited Special Program Chair, EPMI, P/M World Congress, 2010.
* Session Organizer and Chair, Technical Program Committee Member, MPIF, 1999 – 2010

**PROFESSIONAL SOCIETIES**

* TMS - The Minerals, Metals, Materials Society
* ASM - American Society of Metals
* APMI - American Powder Metallurgy Institute

**PUBLICATIONS**

Two books. 184 Peer Reviewed Publications. See separate file.

**PATENTS**

 60 U.S. Patents to date.