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| **Huamiao Wang** | | | | |
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| **Summary** | | | | |
| Creative researcher who integrates theoretical, modeling and experimental efforts for characterizing and understanding the deformation mechanisms at atomic, nano- or micro- scale and their connection to the mechanical behaviors of materials of industrial interest.  ***Google Scholar***: [scholar.google.ca/citations?user=t0fm5MwAAAAJ&hl=en&authuser=1](http://scholar.google.ca/citations?user=t0fm5MwAAAAJ&hl=en&authuser=1) | | | | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | Total publications | First authored | h-index | Citation of most cited article | Total citation | | 35 | 23 | 16 | 160+ | 1000+ | | | | | |
| **Research Interests** | | | | |
| * Multiscale Modeling * Neutron Diffraction * Solid Mechanics * Biomechanics | | * Metal Forming * Finite Element Analysis * Deformation Mechanisms * Nanotechnology | | * Plasticity of Materials * Crystal Plasticity * Design and Manufacturing * Polymer |
| **Educational Background** | | | | |
| Ph.D | **Mechanical Engineering, McMaster University** (2011)  *Thesis: Constitutive modeling of hexagonal close packed polycrystals*  Advisor: Prof. Peidong Wu | | | |
| M.A.Sc. | **Engineering Mechanics, Tsinghua University** (2005)  *Thesis: A conventional strain gradient theory of crystal plasticity*  Advisor: Prof. Keh-Chih Hwang | | | |
| B.Sc. | **Engineering Mechanics, Xi'an Jiaotong University** (2002)  *Thesis: Electro-elastic fields near circular electrode border on piezoelectric medium surface*  Advisor: Prof. Shangheng Huang | | | |
| **Research and Engineering Experience** | | | | |
| 2016-2017 | **Research Associate**, McMaster University   * The previously used method of applying a single rate sensitivity value to all deformation mechanisms cannot interpret the rate-sensitive behaviors of magnesium alloys. A new method of applying different rate sensitivities to different deformation mechanisms are successfully used to interpret the rate-sensitive behaviors of magnesium alloys. * Double-network gels could achieve both high strength and good ductility. However the modelling work is far behind the experimental one. Therefore a multi-scale model is under development to connect the mechanisms at microscale (macromolecule) and the mechanical behavior at macroscale (polymer, double network gels). | | | |
| 2013-2015 | **Research Associate**, Los Alamos National Laboratory   * Shear transformations like twinning and phase transformation play important roles on the mechanical behaviors of materials. In order to understand more, shear transformation was studied by combining multi-scale modeling, in-situ neutron diffraction (ND) measurement and electron back scattered diffraction (EBSD) characterization. * Plastic deformation and fracture of multi-layered nano-composites were studied by using Finite Element Analysis (FEA) and transmission electron microscopy (TEM) measurement. | | | |
| 2011-2013 | **Postdoctoral Fellow**, McMaster University   * Twinning and De-twining are important deformation mechanisms in magnesium alloys. However, there is no available model to model both Twinning and De-twinning.Therefore the very first multi-scale model (EVPSC-TDT model) is developed and applied to the cyclic deformation of magnesium alloys. * Magnesium alloy sheets (or extrusion bars) show poor formability at room temperature. Through comparing the Forming Limit Diagrams (FLDs) constructed by EVPSC model, Imposing hydrostatic pressure and shear deformation during processing are suggested to improve the formability of magnesium alloy sheets. * The spatial information and direction interaction between neighboring grains are neglected by multi-scale models available for magnesium alloys. Therefore a Crystal Plasticity Finite Element Method (CPFEM) is developed and applied to magnesium alloys. The CPFEM is achieved by implementing crystal plasticity into FEA software ABAQUS through its user subroutine UMAT. | | | |
| 2011-2012 | **Visiting Scholar**, Los Alamos National Laboratory   * Earlier internal elastic strain testing methods require multiple interrupts to collect data. These methods introduce unnecessary difficulty in interpreting the data. Therefore a continuous testing technique with slow loading rate is employed to magnesium alloy bar. The comparison among different testing results and modeling results shows the effect of interrupts on the mechanical behavior and the internal elastic strain development. | | | |
| 2006-2011 | **Research Assistant**, McMaster University   * Earlier polycrystal plasticity models have their drawbacks, such as only for small deformation, neglecting elastic deformation, etc. Therefore an elastic viscoplastic self-consistent (EVPSC) model was developed. This model is the best available self-consistent model for describing large strain behavior of HCP materials. * Numerous applications, some are impossible to be modeled before, are modeled by EVPSC model: evolution of internal elastic strain, effect of crystallographic texture on mechanical behavior, formability of magnesium alloys, etc. | | | |
| 2005-2006 | **Engineer**, China General Certificate Center   * To ensure the safety of a wind turbine during working. The Wind turbine's strength, dynamic response and performance was evaluated by using finite element analysis (FEA) * There are inconsistent standards to certify a wind turbine in China. Therefore a consistent criterion of wind turbine certification was first developed. | | | |
| 2002-2005 | **Research Assistant**, Tsinghua University   * Size dependency is observed in crystalline materials. Therefore a size-dependent micro-mechanics model was developed for single crystalline materials. | | | |
| **Supervisory Experience** | | | | |
| 2011-2013 | **Postdoctoral Fellow**, McMaster University   * Supervision of Ph.D students Hua Qiao (McMaster University) and Xiaoqian Guo (China University of Mining and Technology). | | | |
| 2007-2009 | **Research Assistant**, McMaster University   * Supervision of Master student (Tasneem N. Zaman, now lecturer of Sheridan College). | | | |
| **Teaching Experience** | | | | |
| **Teaching Assistant,** McMaster University | | | | |
| 2010 winter | * ***Sustainability and Ethics in Engineering*,** Eng 4A03, 8 hours/week   Instructor: Dr. Katherine Prescott | | | |
| 2009 winter | * ***Engineering Mechanics,*** ME 3A03, 4 hours/week   Instructor: Prof. Gregary Wohl   * ***Manufacturing Engineering***, ME 3C03, 4 hours/week   Instructor: Prof. Eu-Gene Ng | | | |
| 2008 winter | * ***Engineering Mathematics III***, Math 2MM3, 4 hours/week   Instructor: Prof. Gordon Craig   * ***Probability and Statistics for Engineering***, Stats 3Y03, 4 hours/week   Instructor: Prof. Ernest Mead | | | |
| 2006 fall | * ***Mechanical Vibrations*,** ME 4Q03, 8 hours/week   Instructor: Prof. Stephen Veldhuis | | | |
| **Teaching Assistant,** Tsinghua University | | | | |
| 2004 fall | * ***Constitutive Relations of Solids***, 8 hours/week   Instructor: Prof. Keh-Chih Hwang | | | |
| **Leadership Experience** | | | | |
| 2013-2015 | **President**,Los Alamos Chinese Student and Scholar Association   * Activities (Celebrations of Christmas, Thanksgiving, New Year, Chinese New Year, Mid-Autumn Festival, Dragon Boat Festival, etc.) to communicate among Chinese and other communities were organized. | | | |
| 2013-2015 | **Captain**, Los Alamos Chinese Soccer Team   * Soccer games for both exercise and fun were organized. | | | |
| **Awards** | | | | |
| * McMaster Graduate Student Scholarship, McMaster Univ. (2006-2011) * Fellowship of Ontario Ministry of Research and Innovation, McMaster Univ. (2011–2013) | | | | |
| **External Fund** | | | | |
| 2011-2013 | **Ontario Ministry of Research and Innovation (OMRI)**, **Canada**   * Improved EVPSC model for predicting large strain behavior of magnesium alloys. | | | |
| 2013-2015 | **Basic Energy Sciences (BES) sub-project**, **United States**   * Statistical plasticity modeling of hexagonal close packed (HCP) and transformation induced plasticity (TRIP) materials. | | | |
| 2016-now | **Natural Sciences and Engineering Research Council (NSERC)**, **United States**   * Development of a multiscale model to connect the mechanisms at macromolecule scale and the mechanical behavior at macroscopic scale of polymer. | | | |
| **Journal Referee** | | | | |
| * International Journal of Plasticity * Materials Science and Engineering A * International Journal of Applied Mechanics * Journal of Engineering Materials and Technology * Advances in Materials Science and Engineering * International Journal of Solids and Structures | | | * International Journal of Mechanical Science * Computational Materials Science * International Journal of Fatigue * JOM * Materials & Design | |

**Publications (**supervised students are underlined, and \* for corresponding author**)**

**Under preparation (4)**

34. **Wang H.**\*, Li P., Zhao L.L., Wei X.Z.\* (2017) “*Residual stress and warping of metallic overhang structure additively manufactured.*” Rapid Prototyping Journal, under preparation.

33. **Wang H.**\*, Wu P.D. (2017) “*A continuum plasticity model based on transition state theory*.” Scripta Materialia, under preparation.

32. **Wang H.**\*, Wu P.D. (2017) “*Reformulation of the* c*onstitutive models for rubber elasticity and glassy polymer.*” International Journal of Solids and Structures, under preparation.

31. **Wang H.**\*, Wu P.D., Worswick M.J., Li D.Y. (2017) “*Strain rate sensitivities of different deformation mechanisms of magnesium alloys and the strain-rate related behaviors*.” International Journal of Plasticity, under preparation.

**Peer Reviewed International Journal Publications (30)**

30. **Wang H.\***, Capolungo L., Clausen B., Tomé C.N. (2017) “*A crystal plasticity model based on transition state theory.*” International Journal of Plasticity 93, 251-268.d.

29. Guo X.Q., Wu P.D., **Wang H.**, Mao X.B., Neale K.W., (2016) “*Study of large strain behavior of ofhc copper: the role of polycrystal plasticity model*.” International Journal of Solids and Structures 90, 12-21.

28. **Wang H.\***, Lee S.Y., Gharghouri M.A., Wu P.D. (2016) “*Deformation behavior of Mg-8.5wt.%Al alloy under reverse loading investigated by in-situ neutron diffraction and elastic viscoplastic self-consistent modeling*.” Acta Materialia 107, 404-414.

27. **Wang H.\***, Jeong Y., Clausen B., Liu Y., McCabe R.J., Barlat F., Tomé C.N. (2016) “*Effect of martensitic phase transformation on the behavior of 304 austenitic stainless steel under tension*.” Materials Science and Engineering A 649, 174-183.

26. **Wang H.\***, Clausen B., Capolungo L., Beyerlein I.J., Wang J. & Tomé C.N. (2016) “*Stress and strain relaxation in magnesium AZ31 rolled plate: in-situ neutron measurement and elastic viscoplastic polycrystal modeling.*” International Journal of Plasticity 79, 275-292.

25. Qiao H., Wu P.D., **Wang H.**, Gharghouri M.A. & Daymond M.R. (2015) “*Evaluation of elastic-viscoplastic self-consistent polycrystal plasticity models for zirconium alloys*.” International Journal of Solids and Structures 71, 308-322.

24. Guo X.Q., **Wang H.\***, Wu P.D. & Mao X.B. (2015) “*Analysis of reversed torsion of FCC metals using polycrystal plasticity models*.” International Journal of Applied Mechanics 7, article 1550033.

23. Guo X.Q., Wu P.D., **Wang H.** & Mao X.B. (2015) “*Study of lattice strain evolution in stainless steel under tension: The role of self-consistent plasticity model.*” Steel Research International 86, 894-901.

22. Lee S.Y., **Wang H.** & Gharghouri M.A. (2015) “*Twinning*-*detwinning behavior during cyclic deformation of magnesium alloy.*” Metals 5, 881-890.

21. **Wang H.\***, Wu P.D. & Wang J. (2015) “*Numerical assessment of the role of slip and twinning in magnesium alloy AZ31B during loading path reversal*.” Metallurgical and Materials Transactions 46A, 3079-3090.

20. Guo X.Q., **Wang H.\***, Qiao H. & Mao X.B. (2015) “*Numerical study of the large strain behavior of extruded magnesium alloy AM30 tube by elastic viscoplastic self-consistent model.*” Materials & Design 79, 99-105.

19. **Wang H.\***, Wu P.D., Lee S.Y., Wang J. & Neale K.W. (2015) “*The effects of shear deformation and superimposed hydrostatic pressure on the formability of AZ31B sheet at room temperature*.” International Journal of Mechanical Sciences 92, 70-79.

18. **Wang H.\***, Wu P.D. & Wang J. (2015) “*Modelling the role of slips and twins in magnesium alloys under cyclic shear*.” Computational Materials Science 96, 214-218.

17. Li N., **Wang H.**, Misra A. & Wang J. (2014) “*In situ nanoindentation study of plastic co-deformation in Al-TiN nanocomposites*.” Scientific Reports 4, article 6633.

16. Lee S.Y., **Wang H.**, Gharghouri M.A., Nayyeri G., Woo W., Shin E., Wu P.D., Poole W.J., Wu W. & An K. (2014) “*Deformation behavior of solid-solution-strengthened Mg-9wt%Al alloy: in-situ neutron diffraction and elastic viscoplastic self-consistent modeling*.” Acta Materialia 73, 139-148.

15. **Wang H.**, Wu P.D. & Wang J. (2013) “*Modeling inelastic behavior of magnesium alloys during cyclic loading–unloading*.” International Journal of Plasticity 47, 49-64. (Selected by ESI to the top 1% highly cited articles)

14. **Wang H.\***, Wu P.D., Wang J. & Tomé C.N. (2013) “*A physics-based crystal plasticity model for hexagonal close packed (HCP) crystals including both twinning and detwinning mechanisms*.” International Journal of Plasticity 49, 36-52. (Selected by ESI to the top 1% highly cited articles)

13. **Wang H.**, Clausen B., Tomé C.N. & Wu P.D. (2013) “*Studying the effect of stress relaxation and creep on lattice strain evolution of stainless steel under tension*.” Acta Materialia 61, 1179-1188.

12. Wu P.D., **Wang H.** & Neale K.W. (2012) “*On the large strain torsion of HCP polycrystals*.” International Journal of Applied Mechanics 4, article 1250024.

11. **Wang H.**, Wu P.D., Tomé C.N. & Wang J. (2012) “*A constitutive model of twinning and detwinning for HCP polycrystals*.” Materials Science and Engineering A555, 93-98.

10. **Wang H.**, Wu P.D., Tomé C.N. & Wang J. (2012) “*Study of lattice strains in magnesium alloy AZ31 based on a large strain elastic-viscoplastic self-consistent polycrystal model*.” International Journal of Solids and Structures 49, 2155-2167.

9. **Wang H.**, Wu P.D. & Neale K.W. (2012): “*Length changes in extruded magnesium alloy bars under large strain free-end torsion*.” Magnesium Technology 2012, 111-116.

8. **Wang H.**, Wu P.D., Boyle K.P. & Neale K.W. (2011) “*On crystal plasticity formability analysis for magnesium alloy sheets*.” International Journal of Solids and Structures 48, 1000-1010.

7. **Wang H.**, Wu Y., Wu P.D. & Neale K.W. (2010) “*Numerical analysis of large strain simple shear and fixed-end torsion of HCP polycrystals*.” CMC-Computers, Materials & Continua 19, 255-284.

6. **Wang H.**, Wu P.D. & Neale K.W. (2010) “*On the role of the constitutive model and basal texture on the mechanical behavior of magnesium alloy AZ31B sheet*.” Journal of Zhejiang University-Science A11, 744-755.

5. **Wang H.**, Raeisinia B., Wu P.D., Agnew S.R. & Tomé C.N. (2010) “*Evaluation of self-consistent polycrystal plasticity models for magnesium alloy AZ31B sheet*.” International Journal of Solids and Structures 47, 2905-2917. (Selected by ESI to the top 1% highly cited articles)

4. **Wang H.**, Wu P.D. & Gharghouri M.A. (2010) “*Effect of basal texture on mechanical behaviour of magnesium alloy AZ31 Sheet*.” Materials Science and Engineering A527, 3588-3594.

3. **Wang H.**, Wu P.D., Tomé C.N. & Huang Y. (2010) “*A finite strain elastic-viscoplastic self-consistent model for polycrystalline materials*.” Journal of the Mechanics and Physics of Solids 58, 594-612.

2. **Wang H.**, Hwang K.C., Huang Y., Wu P.D., Liu B., Ravichandran G., Han C.S. & Gao H. (2007) "*A conventional theory of strain gradient crystal plasticity based on the Taylor dislocation model*." International Journal of Plasticity 23, 1540-1554.

1. Huang S.H. & **Wang H.** (2004) "*Electro-elastic fields arising near circular electrode border on piezoelectric medium surface*." Chinese Journal of Applied Mechanics 21, 106-109.

**Peer Reviewed International Conference Publications (5)**

5. Qiao H., **Wang H.** & Wu P.D. (2013) “*Analysis of anisotropy of extruded magnesium alloy AZ31 bar*.” AIP Conference Proceedings 1532, 214-221.

4. Lee S.Y., Gharghouri M.A., **Wang H.**, Nayyeri G., Wu P.D., Poole W.J., Wu W. & An K. (2012) “*Deformation behavior of solid-solution-strengthened Mg-9wt.% Al alloy subjected to uniaxial tension.*” Proceedings of the 9th International Conference on Magnesium Alloys and their Applications (ICMAA12), 631-636.

3. **Wang H.**, Wu Y., Wu P.D. & Neale K.W. (2011) “*Influence of hydrostatic pressure on FLDs for AZ31B sheets.*” AIP Conference Proceedings-American Institute of Physics, 343-350.

2. **Wang H.**, Wu P.D., Tomé C.N. (2011) “*Study of lattice strain based on the finite strain elastic-viscoplastic self-consistent model for polycrystalline materials.*” Minerals, Metals and Materials Society/AIME.

1. **Wang H.**, Wu Y., Wu P.D. & Neale K.W. (2011) “*Numerical study of mechanical anisotropy of extruded magnesium alloy AZ31.*” Advances in Heterogeneous Material Mechanics: Proceedings of the Third International Conference on Heterogeneous Material Mechanics, 234-237.

**Selected International Conference Presentations**

13. Tomé C.N., **Wang H.**, Capolungo L., Clausen B. (2015) “Characterizing stress and strain relaxation mechanisms in Mg AZ31 and SS using modeling and neutron diffraction.” MECASENS 8, Grenoble, France, September 30-October 2, 2015

12. Guo X.Q., Wu P.D., **Wang H.**, Mao X.B. & Neale K.W. (2015) “*Study of large strain behavior of OFHC copper: the role of polycrystal plasticity model*.” Plasticity ’15, Montego Bay, Jamaica, January 4-9.

11. Tu S.Y., **Wang H.**, Yu D., Lee S.Y., An K., Yeh J.W. & Huang E.W. (2015) “*In-situ neutron diffraction and elastic-viscoplastic self-consistent (EVPSC) modeling study of deformation behavior of a high-entropy alloy.*” TMS Annual Meeting & Exhibition, Orlando, Florida, USA, March 15-19.

10. Hilairet N., Tomé C.N., **Wang H.**, Merkel S., Wang Y. & Nishiyama N. (2014) “*High-pressure, high-temperature deformation of CaGeO3 (perovskite)±MgO aggregates: Elasto-viscoplastic self-consistent modeling and implications for multi-phase rheology of the lower mantle.*” AGU Fall meeting in San Francisco, December 15-19.

9. **Wang H.**, Clausen B., Tomé C.N. & Beyerlein I.J. (2014) “*Studying the effect of stress relaxation and creep on lattice strain evolution of magnesium alloy AZ31 under tension and compression*.” International Conference on Multiscale Materials Modeling, Berkeley, USA, October 6-10.

8. **Wang H.**, Jeong Y., Clausen B., Tomé C.N. & Barlat F. (2014) “*An effective medium polycrystal model of martensitic phase transformation and application to 304 stainless TRIP steel.*” International Conference on Martensitic Transformation, Bilbao, July 6-11.

7. **Wang H.**, Wu P.D., Wang J. & Tomé C.N. (2013) “*A model of twinning and detwinning and its applications to Mg alloys*.” Plasticity ’13, January 3-8, Sheraton, Nassau, Bahamas.

6. **Wang H.**, Wu Y., Wu P.D. & Neale K.W. (2011) “*Influence of hydrostatic pressure on FLDs for AZ31B sheets*.” The 8th International Conference and Workshop on Numerical Simulation of 3D Sheet Metal Forming Processes (NUMISHEET-2011), Seoul, Republic of Korea, 21-26 August.

5. **Wang H.** & Wu P.D. (2011) “*Analysis of plane strain compression of magnesium single crystals*.” International Conference on Mechanical Properties of Materials, Hangzhou, China, 12-15 June.

4. **Wang H.**, Wu Y., Wu P.D. & Neale K.W. (2011) “*Numerical analysis of large strain fixed-end torsion of magnesium polycrystals*.” International Conference on Computational & Experimental Engineering and Sciences (ICCES’11), Nanjing, China, 18-22 April.

3. **Wang H.**, Wu P.D. & Tomé C. N. (2011) “*Study of lattice strain based on the finite strain elastic-viscoplastic self-consistent model for polycrystalline materials*.” 2011 TMS Annual Meeting & Exhibition, Polycrystal Modelling with Experimental Integration: A Symposium Honoring Carlos Tomé, San Diego, CA, USA, 27 February-3 March.

2. **Wang H.** & Wu P.D. (2010) “*Effects of basal texture on formability of magnesium alloy AZ31B sheet*.” International Conference on Mechanical Properties of Materials, Hangzhou, China, 24-28 May.

1. **Wang H.** & Wu P.D. (2010) “*A large strain elastic-viscoplastic self-consistent model for polycrystalline materials – Development and validation*.” The 16th International Symposium on Plasticity and its Current Applications, St. Kitts, USA, 3-8 January.