Name: Changqiang (CQ) Chen

Research fields of interest, experience and expertise:

- Transmission Electron microscopy: Pushing limits of Imaging, Diffraction, and Spectroscopy techniques
- Atomic-to-micro scale structural and chemical underpinnings of materials properties
- Materials structure and function design by physical metallurgical principles and their characterization
- Nanocomposite thin film: controlled growth via sputtering, structure and properties design
- Nano-sized structures and entities: atomic structure, chemistry, stability, mechanics, and catalytic aspects
- Materials microstructural response under extreme pressure, temperature, irradiation, and strain rates
- In-situ TEM/SEM dynamic characterization: nano-mechanical, environmental, and temperature effects

I have near two decades of experiences in materials research by applying Transmission Electron Microscopy, Spectroscopy, and Diffraction techniques to probing defects and interfaces in materials at micro- atomic and electronic structure levels, and linking them to the bulk properties. I also conduct in-situ characterization and test of materials in TEMs. I have been involved in multidisciplinary research projects covering materials systems ranging from metals, alloys, ceramics, to semiconductors, from the bulk, to thin films and nanostructures (wires, tubes, particles). My previous research projects included the structure evolution of alpha-Ti alloys under cyclic straining and the effect of hydrogen and hydrides therein; the nanomechanical behavior of nano-sized ceramic structures (ZnO, Si) and amorphous alloys; design and fabrication of multilayered diamond-like-carbon based nanocomposite films; materials behavior under extreme pressures and strain rates for defense applications (fcc Al alloys, bcc Ta alloys, SiC, AlN, B_6O ceramics). I also seek structural solution for tailoring the transport properties of semiconductors for energy applications, e.g., the chalcogenide thermoelectric systems (Pb-S-Te, Pb-Sr-S, PbSe etc).

I have published >40 original research papers on leading research journals in societies of Materials, Physics, Chemistry and Metallurgy. The work published has been cited >1500 times.

Instrumentation/core of responsibility within the MRL:
-Transmission and Scanning Electron Microscopy and Spectroscopy

Other instruments of interest and qualified to operate:
-Focused Ion Beam

Education:

Chinese Academy of Sciences	Materials Physics	Ph.D. (2004)
Nanjing University of Science and Technology	Materials Science	Sc.B (1998)

Appointments (Professional experience):

2014 - present	Research Scientist, Frederick Seitz Materials Research Laboratory, University of Illinois at Urbana Champaign, Urbana, IL
2013 - 2014	Assistant Research Scientist, Central Microscopy Research Facility and Molecular Beam Epitaxy Facility, University of Iowa, Iowa City, IA
2012 – 2013	Senior Research Associate, Northwestern University Atomic and Nanoscale Characterization Experimental Center (NUANCE), Northwestern University (NU), Evanston, IL
2010 – 2012	Postdoctoral Research Fellow, Department of Mechanical Engineering, and Hopkins Extreme Materials Institute (HEMI), Johns Hopkins University, Baltimore, MD
2007 – 2009	Research Fellow, Netherlands Materials Innovation Institute (M2i), and Department of Applied Physics, University of Groningen (RuG), The Netherlands
2004 – 2006	Scientist, National Center of Electron Microscopy-Beijing, Tsinghua University, Beijing

Awards and Honors

- "Top Reviewer Award" Issued by Materials Science and Engineering A, (2012);
- "Outstanding Reviewer" awarded By, Acta Materialia Inc, Elsevier (2009);
- "Highly Cited Paper in Physics" (Phys. Rev. Lett., 2006) by ISI Web of knowledge;

- Nomination to "Top 10 Breakthroughs in Chinese Fundamental Research" by Ministry of Science and Technology (MOST) of China, 2007.
- "Changxu Shi Outstanding Graduate Award" (1st place), Chinese Academy of Sciences, 2004

Selected publications:

1. J.N. Florando, B.S. EI-Dasher, C.Q. Chen, D.C. Swift, N.R. Barton, J.M. McNaney, K.T. Ramesh, K.J. Hemker, M. Kumar. Effect of strain rate and dislocation density on the twinning behavior in tatalum. ***AIP Advances***, 6, 045120 (2016)
2. Y. Lee, S. Lo, C.Q. Chen, H. Sun, D.Y. Chung, C. Uher, V.P. Dravid, M.G. Kanatzidis. Contrasting role of antimony and bismuth dopants on the thermoelectric performance of lead selenide. ***Nature Communications,*** 5, 3640, (2014)
3. S.Q. Hao, L.D. Zhao, C.Q. Chen, V.P. Dravid, M.G. Kanatzidis, and C. Wolverton. Theoretical prediction and experimental confirmation of unusual ternary ordered semiconductor compounds in Pb-Sr-S System. ***Journal of American Chemical Society***, 136 (4), 1628-1635 (2014)
4. C.Q. Chen, J. N Florando, M. Kumar, K.T. Ramesh, K. J. Hemker. Incipient deformation twinning in dynamically sheared bcc Tantalum. ***Acta Materialia,*** 69:114-125 (2014)
5. X.Y. Zhou, G.W. Wang, L.J. Guo, H. Chi, G.Y. Wang, Q.F. Zhang, C.Q. Chen, T. Thompson, J. Sakamoto, V. P. Dravid, G.Z. Cao, C. Uher. Hierarchically structured TiO2 for Ba-filled skutterudite with enhanced thermoelectric performance. ***Journal of Materials Chemistry A***, 2(48), 20629-20635 (2014)
6. C.Q. Chen, G. Hu, J. N. Florando, M. Kumar, K.T. Ramesh, K. J. Hemker. Interplay of dislocation slip and deformation twinning in tantalum at high strain rates. ***Scripta Materialia*** **65** (10), 709-102, (2013)
7. C. L. Williams, C. Q. Chen, K. T. Ramesh, D. P. Dandekar. The Effects of Cold Rolling on the Spall Response of 1100 Aluminum". ***Journal of Applied Physics*** **114**, 093502 (2013)
8. G. L. Hu, C. Q. Chen, K. T. Ramesh, J. W. MaCauley. The dynamic deformation and fracture mechanisms of sintered aluminum nitride. ***Acta Materialia***. 66, 3480-3490 (2012).
9. C.Q. Chen, Y. Pei, J. Th. M. De Hosson. Apparently homogeneous yet intrinsically intermittent flow of taper-free metallic glass nanopillars. ***Scripta Materialia***. 67, 947–950 (2012).
10. G. L. Hu, C. Q. Chen, K. T. Ramesh, J. W. MaCauley. Dynamic multiaxial response of a hot-pressed aluminum nitride. ***Scripta Materialia***. 66 (8) 527-530, (2012).
11. O. Kuzmin, Y. Pei, C.Q. Chen, J. Th. M. De Hosson. Intrinsic and extrinsic size effects in the deformation of metallic glass nanopillars. ***Acta Materialia***. 60, 889–898 (2012)
12. Chen, C. Q.; Pei, Y. T.; Kuzmin, O.; et al. Intrinsic size effects in the mechanical response of taper-free nanopillars of metallic glass. ***Physical Review B*** **83** (18) 180201(R) (2011)
13. Shaha, KP; Pei, YT; Chen, CQ; et al. Pulsed DC sputtered DLC based nanocomposite films: controlling growth dynamics, microstructure and frictional properties. ***Materials Technology*** **26** (1), 15-19 (2011)
14. Chen, CQ; Pei, YT; De Hosson, JTM. A statistical physics consideration about the strength of small size metallic glass pillars. ***Journal of Physics: Conf Series***, 15th International Conference on the Strength of Materials (Icsma-15) **240**, 012156 (2010)
15. Pei, YT; Turkin, AA; Chen, CQ; et al. Dynamic smoothing of nanocomposite films. ***Applied Physics Letters*** **96** (15) 151910 (2010).
16. Chen, CQ; Pei, YT; De Hosson, JTM. Effects of size on the mechanical response of metallic glasses investigated through in situ TEM bending and compression experiments. ***Acta Materialia*** **58** (1) 189-200 (2010).
17. Turkin, AA; Pei, YT; Shaha, KP; et al. On the evolution of film roughness during magnetron sputtering deposition. ***Journal of Applied Physics*** **108** (9) 094330 (2010)
18. Shaha, KP; Pei, YT; Chen, CQ; et al. Synthesis of ultra-smooth and ultra-low friction DLC based nanocomposite films on rough substrates. ***Thin Solid Films*** **519** (5) 1618-1622 (2010)
19. Chen, CQ; Pei, YT; Shaha, KP; et al. Tunable self-organization of nanocomposite multilayers. ***Applied Physics Letters*** **96** (7) 073103 (2010)
20. Shaha, KP; Pei, YT; Chen, CQ; et al. Dynamic smoothening and tribological properties of pulsed-DC sputtered DLC based nanocomposite films
    Surface Effects and Contact Mechanics Ix Pages: 3-11 Published: 2009.
21. Pei, YT; Shaha, KP; Chen, CQ; et al. Growth of nanocomposite films: From dynamic roughening to dynamic smoothening. ***Acta Materialia*** **57** (17) 5156-5164 (2009)

22. Chen, CQ; Pei, YT; De Hosson, JTM. In-Situ TEM Investigation of Deformation Behavior of Metallic Glass Pillars. ***Probing Mechanics at Nanoscale Dimensions*** **1185**, 99-104 (2009)
23. Chen, CQ; Pei, YT; Shaha, KP; et al. Nanoscale deformation mechanism of TiC/a-C nanocomposite thin films. ***Journal of Applied Physics*** **105** (11) 114314 (2009)
24. Shaha, KP; Pei, YT; Chen, CQ; et al. On the dynamic roughening transition in nanocomposite film growth. ***Applied Physics Letters*** **95** (22) 223102 (2009).
25. Chen, CQ; Pei, YT; De Hosson, JTM. Strength of submicrometer diameter pillars of metallic glasses investigated with in situ transmission electron microscopy. ***Philosophical Magazine Letters*** **89** (10) 633-640 (2009).
26. Turkin, AA; Pei, YT; Shaha, KP; et al. Surface roughness evolution of nanocomposite thin films. ***Journal of Applied Physics*** **105**, 013523 (2009)
27. Chen, CQ; Pei, YT; Shaha, KP; et al. Cross-sectional TEM observation and nanoindentation study of multilayered nanocomposite coatings. ***Advances in Heterogeneous Material Mechanics*** 2008 1335-1339 (2008).
28. Pei, YT; Chen, CQ; Shaha, KP; et al. Microstructural control of TiC/a-C nanocomposite coatings with pulsed magnetron sputtering. ***Acta Materialia*** **56** (4) 696-709 (2008).
29. Chen, CQ; Pei, YT; Shaha, KP; et al. Nanoscale deformation in TiC/a-C multilayered nanocomposite coatings. ***Applied Physics Letters*** **92** (24) 241913 (2008)
30. Chen, CQ; Zhu, J. Bending strength and flexibility of ZnO nanowires. ***Applied Physics Letters*** **90** (4) 043105 (2007)
31. Shi, Y; Chen, CQ; Zhang, YS; et al. Determination of the natural frequency of a cantilevered ZnO nanowire resonantly excited by a sinusoidal electric field. ***Nanotechnology*** **18** (7) 075709 (2007)
32. De Hosson, JTM; Pei, YT. Jerky-type phenomena at nanocomposite surfaces: The breakdown of the coulomb friction law. Chen, CQ**.** ***JOM*** **59** (7) 45-49 (2007)
33. Pei, YT; Shaha, KP; Chen, CQ; et al. Microstructural evolution of TiC/a-C nanocomposite coatings with pulsed magnetron sputtering. Computer Methods and Experimental Measurements for Surface Effects and Contact Mechanics VIII Volume: **55**, 65-74, 2007
34. Chen, CQ; Shi, Y; Zhang, YS; et al. Size dependence of Young's modulus in ZnO nanowires. ***Physical Review Letters*** **96** (7) 075505 (2006).
35. Zhang, YS; Wang, LS; Liu, XH; et al. Synthesis of nano/micro zinc oxide rods and arrays by thermal evaporation approach on cylindrical shape substrate. ***Journal of Physical Chemistry B*** **109** (27) 13091-13093 (2005)
36. Chen, CQ; Li, SX; Zheng, H; et al. An investigation on structure, deformation and fracture of hydrides in titanium with a large range of hydrogen contents. ***Acta Materialia*** **52** (12) 3697-3706 (2004)
37. Chen, CQ; Li, SX; Lu, K. Dislocation interaction with hydrides in titanium containing a low hydrogen concentration. ***Philosophical Magazine*** **84** (1) 29-43 (2004)
38. Chen, CQ; Li, SX; Li, GY; et al. Microstructure of cyclically deformed titanium with low hydrogen concentration I. Crystal rotation and formation of cell structure near hydrides. ***Acta Metallurgica Sinica*** **40** (3) 235-240 (2004)
39. Chen, CQ; Li, SX; Li, GY; et al. Microstructure of cyclically deformed titanium with low hydrogen concentration II. Dissolution of gamma hydrides and formation of strain induced hydrides. ***Acta Metallurgica Sinica*** **40** (3) 241-244 (2004)
40. Chen, CQ; Li, SX. Tensile and low-cycle fatigue behaviors of commercially pure titanium containing gamma hydrides. ***Materials Science and Engineering A***-Structural Materials Properties Microstructure and Processing **387-89,** 470-475 (2004)
41. Chen, CQ; Li, SX; Lu, K. The deformation behaviors of gamma hydrides in titanium under cyclic straining. ***Acta Materialia*** **51** (4) 931-942 (2003)
42. Chen, CQ; Li, SX; Lu, K. The different deformation behaviors of the two types of gamma hydrides in pure titanium under cyclic straining. ***Acta Metallurgica Sinica*** **39** (2) 120-125 (2003)