

PENG LUO

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APPOINTMENTS

- 2019-present **Postdoc.**, Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana Champaign (UIUC), Illinois, USA.
Project: Studying the structure and dynamics of glass forming liquids by neutron and x-ray scattering
- 2018-2019 **Research Associate**, Institute of Physics, CAS, China.
Project: Studying the interfacial relaxation dynamics of liquids near hard wall

EDUCATION

- 2013-2018 **Ph.D.**, Condensed Matter Physics, Institute of Physics, CAS, China
Dissertation: Investigations of the relaxation dynamics in metallic glassy state; Advisor: Prof. W.H. Wang
- 2009-2013 **B.S.**, Materials Science and Engineering, South China University of Technology (SCUT), China
Dissertation: Development of novel Zr-Cu-Al-Fe bulk metallic glasses; Advisor: Prof. G. Wang

RESEARCH EXPERIENCE

Ph.D. thesis research at Institute of Physics, CAS:

Goal: understanding the complex dynamics in glasses and the microscopic mechanisms underlying their macroscopic properties, exploring the formation of ultrastable metallic glasses (MGs) at low substrate temperatures.

Approaches: I have implemented a complementary approach by combining laboratory instruments and advanced synchrotron-based techniques, getting therefore information over different length and time scales. I have also been working on synthesizing MG films with tailored structures and tunable properties by physical vapor deposition.

Achievements: found in MGs the two-step stress relaxation, unveiling thus a new relaxation decoupling; found that consistent with the enthalpy recovery, the boson peak shows memory effect, demonstrating a direct link between slow structural relaxation and fast boson peak dynamics; developed new yttrium based MGs showing the most prominent β -relaxations; found that the intermittent atomic rearrangements in MGs originates from the intensive spontaneous activation of secondary relaxation processes being strongly affected by the heterogeneous structure and the overall stability of the system; ultrastable MG with an unprecedented enhancement of T_g up to ~ 60 K was obtained even on cold substrate far below T_g ($\approx 0.43T_g$), suggesting much faster-than-expected surface dynamics.

EXPERIMENTAL SKILLS

1. Dynamics, thermodynamics and structure analysis facilities like DMA, DSC, PPMS, XRD, SEM, TEM, AFM
2. Synchrotron high-energy X-Ray diffraction in amorphous structure and dynamics
3. Mechanical properties tests
4. Ultrasonic and elastic measurement in different materials
5. Preparing metallic glasses, metallic glass based composites and nanocrystalline materials by various melting-solidification methods and physical vapor deposition

JOURNAL PUBLICATIONS

1. **P. Luo**, C. R. Cao, F. Zhu, Y. M. Lv, Y. H. Liu, P. Wen, H. Y. Bai, G. Vaughan, M. di Michiel, B. Ruta, and W. H. Wang, Ultrastable metallic glasses formed on cold substrates, *Nature Communications* 9, 1389 (2018).
2. **P. Luo**, P. Wen, H. Y. Bai, B. Ruta, and W. H. Wang, Relaxation decoupling in metallic glasses at low temperatures, *Physical Review Letters* 118, 225901 (2017). (**Editor's Suggestion** and highlighted by *Physics Viewpoint* and *MRS Bulletin*)
3. **P. Luo**, Y. Z. Li, H. Y. Bai, P. Wen, and W. H. Wang, Memory effect manifested by a boson peak in metallic glass, *Physical Review Letters* 116, 175901 (2016).
4. **P. Luo**, M. X. Li, H. Y. Jiang, P. Wen, H. Y. Bai, and W. H. Wang, Temperature dependent evolution of dynamic

- heterogeneity in metallic glass, *Journal of Applied Physics* 121, 135104 (2017).
5. **P. Luo**, Z. Lu, Y. Z. Li, H. Y. Bai, P. Wen, and W. H. Wang, Probing the evolution of slow flow dynamics in metallic glasses, *Physical Review B* 93, 104204 (2016).
 6. **P. Luo**, Z. Lu, Z. G. Zhu, Y. Z. Li, H. Y. Bai, and W. H. Wang, Prominent β -relaxations in yttrium based metallic glasses, *Applied Physics Letters* 106, 031907 (2015).
 7. **P. Luo**, Y. M. Lv, L. Q. Shen, Y. C. Hu, P. Wen, H. Y. Bai, W. H. Wang, Long range interfacial effect on liquid relaxation dynamics, *submitted*.
 8. **P. Luo**, M. X. Li, B. Ruta, P. Wen, Y. H. Liu, Q. S. Zeng, H. Y. Bai, and W. H. Wang, Dynamical and structural origin of the intermittent atomic rearrangements in metallic glasses, *in preparation*.
 9. L. Q. Shen, **P. Luo**, Y. C. Hu, H. Y. Bai, Y. H. Sun, B. A. Sun, Y. H. Liu, and W. H. Wang, Shear-band affected zone revealed by magnetic domains in a ferromagnetic metallic glass, *Nature Communications* 9, 4414 (2018).
 10. L. Chen, C. R. Cao, J. A. Shi, Z. Lu, Y. T. Sun, **P. Luo**, L. Gu, H. Y. Bai, M. X. Pan, and W. H. Wang, Fast surface dynamics of metallic glass enable superlatticelike nanostructure growth, *Physical Review Letters* 118, 016101 (2017).
 11. M. X. Li, **P. Luo**, Y. T. Sun, P. Wen, H. Y. Bai, Y. H. Liu, and W. H. Wang, Significantly enhanced memory effect in metallic glass by multistep training, *Physical Review B* 96, 174204 (2017).
 12. H. Y. Jiang, **P. Luo**, P. Wen, H. Y. Bai, W. H. Wang, and M. X. Pan, The near constant loss dynamic mode in metallic glass, *Journal of Applied Physics* 120, 145106 (2016).

CONFERENCE PRESENTATIONS

1. 2018 MRS Fall Meeting, Boston, USA, 2018.11. The formation of ultrastable metallic glasses on cold substrates. *Oral presentation*.
2. 8th International Discussion Meeting on Relaxations in Complex Systems (8IDMRCS), Wisla, Poland, 2017.07. Go deeper into glass: Finding a new relaxation decoupling in metallic glasses. *Oral presentation*.
3. 3rd International Conference on Packing Problems, Shanghai, China, 2016.08. Rich dynamics in metallic glasses: Boson peak, structural relaxation, β -relaxation and their underlying correlations. *Oral presentation*.
4. Workshop on the Relaxation Behaviors in Amorphous Materials, Qinhuangdao, China, 2016.08. Rich dynamics in metallic glasses: Boson peak, memory effect, and two-step relaxation. *Oral presentation*.
5. 2nd Herbert Gleiter Institute colloquium, Nanjing, China, 2015.11. Probing the fast and extremely slow motions in metallic glass. *Oral presentation*.
6. 3rd Sino-German Workshop on Metallic Glasses, Hefei, China, 2015.05. Prominent β -relaxations in yttrium based metallic glasses. *Poster presentation*.

SELECTED AWARDS & HONORS

2018	Excellent Student Awards, awarded by Chinese Materials Research Society
2018	Pacemaker to Merit Student, awarded by CAS
2017	Special Prize of President Scholarship of CAS (10 Top Ph.D. students in CAS), awarded by CAS
2017	China National Scholarship for Doctoral Student, awarded by Ministry of Education of China
2017	University of CAS-BHP Billiton Scholarship, awarded by University of CAS and BHP Billiton
2017	Prize of President Scholarship of IOP, awarded by IOP
2016	Outstanding Prize of President Scholarship of IOP and title of "Excellent Postgraduate Student", awarded by IOP
2015	Outstanding Prize of President Scholarship of IOP, awarded by IOP
2013	Excellent Graduation Thesis, awarded by SCUT
2012	China National Scholarship for Undergraduate Student, awarded by Ministry of Education of China
2012	The first prize of National Collegiate Metallographic Experiment Competition, awarded by Ministry of Education of China
2012	Excellent Student Awards, awarded by SCUT