Wei Tan

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Education

Queen's University Belfast (QUB) Belfast, UK
PhD in Aerospace Engineering *Oct. 2012 – Feb 2016*

Central South University (CSU) Changsha, China
Master in Mechanical Engineering, transferred to PhD *Sep. 2011 – July 2012*

Central South University Changsha, China
Bachelor in Mechanical Engineering, Minor in Physics *Sep. 2007 – July 2011*

Research Experience

Senior Lecturer (since Sep. 2022), Lecturer in Mechanical Engineering Jan. 2020 – Present
Queen Mary University of London (QMUL) *London, UK*

- Computational modelling the failure of engineering materials and structures.
- Mechanics of multifunctional composite materials for energy-storage.
- Mechanics of cellular composites for crash energy absorption.

Research Associate, Advisor: Prof. Norman Fleck (FRS, FREng) June 2016 – Dec. 2019
University of Cambridge *Cambridge, UK*

- Manufactured direct-spun carbon nanotube (CNT) mat polymer composites with various composition.
- Characterisation of mechanical, electrical and thermal properties of CNT mat-epoxy composites.
- Proposed a micromechanical model for CNT mat-epoxy composites.
- Developed and investigated CNT-polyaniline structural supercapacitor, collaborating with Dr. Michael De Volder

Lecturer in Composite Materials Feb. 2016 – June 2016
Central South University *Changsha, China*

- Characterisation the microscale interfacial strength of fibre-reinforced composites.
- Developed a multi-scale computational model for fibre-reinforced composites.

Research assistant, Supervisor: Prof. Brian Falzon(FRAes) Oct. 2012 – Feb. 2016
Queen's University Belfast *Belfast, UK*

- Virtual testing and design of composite aerostructures under impact and crush loading.
- Developed a multi-scale computational model for fibre-reinforced composites.

Grants

Principal Investigator Feb. 2016 – Present

- CELLCOMP: Data-driven Mechanistic Modelling of Scalable Cellular Composites for Crash Energy Absorption, EPSRC, Grant NO. EP/V049259/1, 2021-2024, £392k, UK
- Decoding the Material Degradation Mechanisms Under High-velocity Liquid-solid Impact Loadings, Royal Society, Grant NO. RGS131417, 2023-2024, £70k, UK
- Structural supercapacitors using hybrid carbon fibre/carbon nanotube composites, funded by University of Cambridge, CAPE Acorn Blue Sky Research Award, Grant NO. NMZD/256, 2017-2018, £20k, UK
- Multiscale-modelling of carbon fibre reinforce plastic under different autoclave cure pressure, funded by Central South University, Grant NO. ZZYJKT2016-04, 2016-2018, about £22k, China

Co-Investigator April 2020 – Present

- Thermal-mechanical modelling of graphene-related composite materials, Graphene Flagship Core Project 3, funded by EU Commission - Horizon 2020, No. 881603, 2020-2023, £376K, EU

Teaching

Computational and Mathematical Modelling 1, Lecturer, 520+ 1st-year UG Sep. 2021 – Present

- Integrate Math, Statics and Python to deliver a student-centred, open-ended active learning experience.

Failure of Solids, Lecturer, 150+ 3rd-year UG and MSc students Jan. 2020 – Present

- Teach students the failure mechanisms including plasticity, fracture, fatigue and creep.

Ceramics, Lecturer, 120+ 4th-year UG students at QMUL-NPU institute Oct. 2020 – Present

- To allow students to understand and analyse the mechanical properties of ceramics materials.

Materials, Tutor, Two 2nd-year students at Cambridge Sep. 2016 –Dec. 2017

Mechanics of composite materials, Tutor, 50 3rd-year UG students, QUB Jan. 2012 – May 2015

Supervision

Primary supervisor Jan. 2020 – Present

- Postdoc researcher: Dr. Siamak Khosroshahi, 2022-present, QMUL, Project: Data-driven Mechanistic Modelling of Scalable Cellular Composites for Crash Energy Absorption.
- PhD student: Emilio Felipe Gomez, 2020-present, QMUL, Project: Developing crashworthy and thermally conductive graphene related composite materials for electrical car battery assembly.
- PhD student: Hirak Kansara, 2021-present, QMUL, Project: Developing novel cellular composites for Crash Energy Absorption using Data-driven methods.
- PhD student: Wenqi Wang, 2021-present, QMUL, Project: Scalable cellular composites for crashing energy absorption.
- PhD student: Jie Yang, 2022-present, QMUL, Project: Multiphysics Modelling and Experimental Investigation for Developing Resilient Electrodes.
- PhD student: Afni Restasari, 2022-present, QMUL, Project: Developing self-healing elastomer coatings for wind turbine blades.
- Visiting PhD student: Zhengqiang Cheng, 2021-present, QMUL, project: Low-velocity impact damage tolerance of carbon fibre composites.
- MSc student: Kit Au-Yeung, 2021-present, QMUL, project: Phase-Field Fracture Modelling of Anisotropic Composite Laminates.
- MEng students: Gary Koh, Merrin Rose Varghese, Hirak Kansara, John Luk, 2020-2021, QMUL, Project: 3D Printed Cellular Composites for Impact Mitigation or Crash Energy Absorption.
- MEng students: Abdulaziz Nasiruddin, Evangelos Koliolios, Daniel Mills, Wei-kong Mao, 2020-2021, QMUL, Project: The crashworthiness of carbon nanotube composite electrodes for energy-storage applications.

Co-supervisor Jan. 2021 – Present

- PhD student: Qichen Zhou, 2021-Present, QMUL, Project title:silk-based fibre-reinforced composites. (Primary supervisor: Dr. Emiliano Bilotti)

Award

Academic activities

- Bronze Award, Written Paper Prize, Royal Aeronautical Society, UK, 2018
- Cambridge engineering department photo competition, SEM prize, UK, 2017
- Second best research poster in Sir Bernard Crossland Competition, UK, 2013

Extracular activities

- Outstanding graduate student, Central South University, China, 2011
- First prize of Mechanical Innovative Design Competition of Hunan province (Team leader), China, 2010
- Internship at Sany Co., Ltd. (3rd-largest heavy equipment manufacturer in the world), China, July 2010–Sep.2010

Membership of Professional Bodies

- Fellow of Higher Education Academy Sep. 2022 – Present
- Board member of UK Association for Computational Mechanics Jan. 2021 – Present
- Local organiser committee member of International Conference on Composite Materials 2021 Sep. 2020 – Present
- Member of European Mechanics Society Aug. 2018 – Present
- Member of Royal Aeronautical Society Oct. 2012 – Present
- President of Student Branch of AIAA Belfast Sep. 2013 – Sep. 2015

Editorial Board

- Frontiers in Mechanical Engineering, **Associate Editor** for Solid Mechanics Section Jan. 2021 – Present
- Polymers, Topic Editor Jan. 2021 – Present

Invited talk

- Delivered a lecture "Multiscale modelling of composite materials", Campus Arts et Métiers de Metz, on invitation from Dr. Francis Praud, May 2022, France.
- Delivered a lecture "Multiscale modelling of composite materials: from load-bearing to shape-morphing", Dalian University of Technology, on invitation from Prof. Bin Niu, May 2022, China.
- Delivered a lecture "Mechanics of composite materials: From load bearing to shape morphing", Materials Engineering Mechanics Seminars, Imperial College London, on invitation from Dr. Emilio Martínez-Pañeda, April 2022, UK.
- Deliver an invited talk "Multifunctional composite materials: From load bearing to energy storage", at University of Manchester, on invitation from Prof. Shengping Shen, Dec 2019, China
- Deliver an invited talk "The mechanical and energy-storage properties of carbon nanotube-polymer composites", at University of Manchester, on invitation from Dr. Daniel Mulvihill, June 2019, UK
- Deliver an invited talk "Progress in composite damage modelling", at Wuhan University, on invitation from Prof. Sheng Liu, May 2019, China
- Deliver an invited talk "Mechanics of composite materials: From load bearing to energy storage", at Southern University of Science and Technology, on invitation from Prof. Yijun Liu, May 2019, China
- Deliver an invited talk "Multiscale modelling of composites materials", at Central South University, on invitation from Prof. Kui Wang, April 2018, China
- Deliver an invited talk "Crushing modelling of composites structures", at Hunan University, on invitation from Prof. Guangyong Sun, April 2018, China
- Delivered a lecture "Properties of Carbon nanotube and their composites", Micromechanics seminar, University of Cambridge, on invitation from Prof. Norman Fleck, October 2017, UK.
- Delivered a lecture "Advanced Damage modelling of composite aerostructures", Huazhong University of Science and Technology, on invitation from Prof. Renfu Li, December 2016, China.
- Delivered a lecture "Advanced computational modelling of composite aerostructures", Northwestern Polytechnical University, on invitation from Prof. Yongjie Zhang, December 2016, China.
- Delivered a lecture "Modelling the behaviour of thermoplastic composite under crushing loading", IMDEA material institute, on invitation from Dr. Claudio Lopes, April 2016, Spain.
- Delivered a lecture "Virtual testing of composite aerostructures", Beihang University, on invitation from Prof. Zixing Lu, January 2015, China.
- Delivered a lecture "Damage modelling of composite aerostructures", Shanghai Jiaotong University, on invitation from Prof. Hai Wang, January 2015, China.

Publications

Journal papers (*Corresponding author):

1. J.-J. Mao, S. Wang, W. Tan, M. Liu, Modular multistable metamaterials with reprogrammable mechanical properties, Engineering Structures 272 (2022) 114976
2. Z.-Q. Cheng, W. Tan, J.-J. Xiong, Modelling pre-fatigue, low-velocity impact and post-impact fatigue behaviours of composite helicopter tail structures under multipoint coordinated loading spectrum, Thin-Walled Structures 176 (2022) 109349
3. X. Wang, P. Li, D. Xiang, B. Wang, Z. Zhang, J. Zhang, C. Zhao, H. Li, W. Tan, J. Wang, et al., Influence of high-temperature, high-pressure, and acidic conditions on the structure and properties of high-performance organic fibers, Materials Testing 64 (5) (2022) 623–635
4. Z.-Q. Cheng, J.-J. Xiong, W. Tan*, Fatigue crack growth and life prediction of 7075-t62 aluminium-alloy thin-sheets with low-velocity impact damage under block spectrum loading, International Journal of Fatigue (2021) 106618
5. E. Koliolios, D. G. Mills, J. J. Busfield, W. Tan*, The nail penetration behaviour of carbon nanotube composite electrodes for energy storage, Frontiers in Materials (2021) 429
6. W. Tan, J. C. Stallard, C. Jo, M. F. De Volder, N. A. Fleck, The mechanical and electrochemical properties of polyaniline-coated carbon nanotube mat, Journal of Energy Storage 41 (2021) 102757
7. W. Tan, E. Martínez-Pañeda, Phase field predictions of microscopic fracture and r-curve behaviour of fibre-reinforced composites, Composites Science and Technology (2021) 108539
8. T. Gspann, A. Kaniyoor, W. Tan, P. Kloza, J. Bulmer, J. Mizen, G. Divitini, J. Terrones, D. Tune, J. Cook, et al., Catalyst-mediated enhancement of carbon nanotube textiles by laser irradiation: Nanoparticle sweating and bundle alignmen, Catalyst 2021 (11) (2021) 368
9. W. Tan*, B. G. Falzon, A crystal plasticity phenomenological model to capture the non-linear shear response of carbon fibre reinforced composites, International Journal of Lightweight Materials and Manufacture 4 (1) (2020) 99–109
10. W. Tan*, B. Liu, A physically-based constitutive model for the shear-dominated response and strain rate effect of carbon fibre reinforced composites, Composites Part B: Engineering (2020) 108032
11. W. Tan, J. C. Stallard, F. R. Smail, A. M. Boies, N. A. Fleck, The mechanical and electrical properties of direct-spun carbon nanotube mat-epoxy composites, Carbon 150 (2019) 489–504
12. H. Liu, B. G. Falzon, S. Li, W. Tan, J. Liu, H. Chai, B. R. Blackman, J. P. Dear, Compressive failure of woven fabric reinforced thermoplastic composites with an open-hole: an experimental and numerical study, Composite Structures 213 (2019) 108–117
13. X. Li, D. Ma, H. Liu, W. Tan, X. Gong, C. Zhang, Y. Li, Assessment of failure criteria and damage evolution methods for composite laminates under low-velocity impact, Composite structures 207 (2019) 727–739
14. H. Liu, B. Falzon, G. Catalanotti, W. Tan, An experimental method to determine the intralaminar fracture toughness of high-strength carbon-fibre reinforced composite aerostructures, The Aeronautical Journal (2018) 1–19
15. X. Zhang, W. Tan, F. Smail, M. De Volder, N. Fleck, A. Boies, High-fidelity characterization on anisotropic thermal conductivity of carbon nanotube sheets and on their effects of thermal enhancement of nanocomposites, Nanotechnology 29 (36) (2018) 365708
16. J. Stallard, W. Tan, F. Smail, T. Gspann, A. Boies, N. Fleck, The mechanical and electrical properties of direct-spun carbon nanotube mats, Extreme Mechanics Letters 21 (2018) 65–75

17. R. Jiang, L. Yang, H. Liu, W. Tan*, X. Sun, H. Cheng, W. Mao, A multiscale methodology quantifying the sintering temperature dependent mechanical properties of oxide matrix composites, Journal of the American Ceramic Society (2018)
18. W. Tan*, F. Naya, L. Yang, T. Chang, B. Falzon, L. Zhan, J. Molina-Aldareguía, C. González, J. Llorca, The role of interfacial properties on the intralaminar and interlaminar damage behaviour of unidirectional composite laminates: Experimental characterization and multiscale modelling, Composites Part B: Engineering 138 (206–221) (2018)
19. H. Liu, B. G. Falzon, W. Tan, Predicting the compression-after-impact (cai) strength of damage-tolerant hybrid unidirectional/woven carbon-fibre reinforced composite laminates, Composites Part A: Applied Science and Manufacturing 105 (2018) 189–202
20. T. Chang, L. Zhan, W. Tan, S. Li, Effect of autoclave pressure on interfacial properties at micro-and macro-level in polymer-matrix composite laminates, Fibers and Polymers 18 (8) (2017) 1614–1622
21. H. Liu, B. G. Falzon, W. Tan, Experimental and numerical studies on the impact response of damage-tolerant hybrid unidirectional/woven carbon-fibre reinforced composite laminates, Composites Part B: Engineering 136 (2018) 101–118
22. T. Chang, L. Zhan, W. Tan*, S. Li, Optimization of curing process for polymer-matrix composites based on orthogonal experimental method, Fibers and Polymers 18 (1) (2017) 148–154
23. T. Chang, L. Zhan, W. Tan*, S. Li, Void content and interfacial properties of composite laminates under different autoclave cure pressure, Composite Interfaces 24 (5) (2017) 529–540
24. W. Tan, B. G. Falzon, Modelling the crush behaviour of thermoplastic composites, Composites Science and Technology 134 (2016) 57–71
25. W. Tan, B. G. Falzon, Modelling the nonlinear behaviour and fracture process of as4/pekk thermoplastic composite under shear loading, Composites Science and Technology 126 (2016) 60–77
26. W. Tan, B. G. Falzon, M. Price, H. Liu, The role of material characterisation in the crush modelling of thermoplastic composite structures, Composite Structures 153 (2016) 914–927
27. B. Falzon, W. Tan, Predicting impact damage, residual strength and crashworthiness of composite structures, SAE International Journal of Materials and Manufacturing 9 (3) (2016) 718–728
28. W. Tan, B. G. Falzon, L. N. Chiu, M. Price, Predicting low velocity impact damage and compression-after-impact (cai) behaviour of composite laminates, Composites Part A: Applied Science and Manufacturing 71 (2015) 212–226
29. W. Tan, B. G. Falzon, M. Price, Predicting the crushing behaviour of composite material using high-fidelity finite element modelling, International journal of crashworthiness 20 (1) (2015) 60–77
30. W. Tan, J. Tan, Y. Liu, Z. Tan, Electromagnetic and hydrodynamic characteristics of the extracorporeal magnetic driving system for an axial flow blood pump, Magnetohydrodynamics 48 (3) (2012) 543–556

Book chapter:

1. B. G. Falzon, W. Tan, Virtual testing of composite structures: progress and challenges in predicting damage, residual strength and crashworthiness, in: The structural integrity of carbon fiber composites, Springer, Cham, 2017, pp. 699–743

Patent:

1. J. Tan, W. Tan, Y. Liu, Z. Tan, A new extracorporeal magnetic driving system for an axial flow blood pump, cN Patent CN 102500002 B (Oct. 27 2011)

Conference presentations and proceedings:

1. W. Tan, Towards structural solid-state pseudocapacitors: the electrochemical and mechanical behaviour of carbon nanotube-polyaniline composites, in: ICCS23 & MECHCOMP6, Porto, 2020
2. W. Tan, The mechanical and energy-storage properties of carbon nanotube-polymer composites, in: International Workshop on Graphene and Carbon Nanotubes in Experimental Mechanics, Manchester, 2019 (Invited speaker)
3. W. Tan, H. Tankasala, N. A. Fleck, The stiffness and strength of epoxy-infilled carbon-nanotube mats, in: 10th European Solid Mechanics Conference, Bologna, Italy, 2018
4. B. Falzon, W. Tan, Predicting impact damage, residual strength and crashworthiness of composite structures, SAE International Journal of Materials and Manufacturing 9 (3) (2016) 718–728
5. W. Tan, B. G. Falzon, L. N. Chiu, M. Price, Numerical prediction of the low-velocity impact damage and compression after impact strength of composite laminates, in: IOP Conference Series: Materials Science and Engineering, Vol. 74, IOP Publishing, 2015, p. 012015

Reviewer

- Journals: Composite Science and Technology, Composite Part A, Composite Part B, Internationals Journal of Impact Engineering, Journal of Composite Materials, Thin-walled structure, etc
- Elsevier book: Damage Analysis of Composites

Outreach and other activities

- SEMS Outreach Academic Lead at QMUL, 2022 – Present
- SEMS Library Representative at QMUL, 2021 – Present
- Presenter at 1st Belfast Science Festival, Mar. 2015