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Professor Zhibing Zhang BSc, MSc, PhD, CEng, FIChemE

Professor of Chemical Engineering

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About

Professor Zhang has built an international reputation for developing original work on micromanipulation of single micro-/nanoparticles and encapsulation/bioencapsulation with applications in chemical, food, nutraceutical, pharmaceutical, household care and human care industries.

Professor Zhang is a member of the Editorial Boards of *Journal of Microencapsulation; Artificial Cells, Blood Substitutes and Biotechnology* and *International Journal of Chemical Engineering*, EPSRC Peer Review College, an Overseas Assessor of Chinese Academy of Sciences, and an Assessor for IChemE Accreditation.

He has authored and co-authored over 100 journal papers and approximately 200 other publications (refereed conference papers, book chapters, conference presentations, patent, etc).

Qualifications

- PhD, Chemical Engineering, East China University of Science and Technology, Shanghai, China, 2.1988
- MSc, Chemical Engineering, East China University of Science and Technology, Shanghai, China, 3.1985
- BSc, Chemical Engineering, 1st Class Equivalent, Hefei University of Technology, Hefei, China, 7.1982

Biography

- Industrial Secondment in Granutec, Germany, 10.2010 & 3.2011
- Industrial Secondment in Procter & Gamble, 7.2007-11.2007
- Professor of Chemical Engineering, University of Birmingham, 10.2004-
- Visiting Professor, Ecole des Mines d'Albi-Carmaux, Albi, France, 5.2003-9.2003
- Reader in Chemical Engineering, University of Birmingham, 10.2001-9.2004
- Senior Lecturer in Chemical Engineering 10.1999-9.2001
- Lecturer, School of Chemical Engineering, University of Birmingham, 8.1995 -9.1999
- Research Fellow (RF2), School of Chemical Engineering, University of Birmingham, 10.1994 - 7.1995
- Research Fellow (RA1A), School of Chemical Engineering, University of Birmingham, 10.1990 - 9.1994
- Honorary Research Fellow, School of Chemical Engineering, University of Birmingham, 9.1989 - 9.1990
- Lecturer, UNILAB Research Centre for Chemical Reaction Engineering, East China University of Science and Technology, China, 4.1988 - 9.1989
- Researcher Fellow, UNILAB Research Centre for Chemical Reaction Engineering, East China University of Science and Technology, China, 2.1988 - 4.1988

Teaching

Teaching programmes

- Mathematical Modelling of Time Dependent Processes
- System Modelling
- Advanced Reaction Engineering B
- Measurement Techniques
- Molecular Delivery/Encapsulation
- Supervision of MEng and MSc research projects
- Co-ordinator of 4th year MEng research projects

Postgraduate supervision

Principal supervisor of:

- A. Fernandez

- R. Manton
- Wan Rosmiza
- Y. He
- X. Pan
- S. Pancholi
- D. Tanangteerapong
- P. Hudson (EngD)
- Tom Coughlin (EngD)

Co-supervisor of :

- Y. Zhang
- V. Davda

Research

Research themes

- Bioengineering
- Energy and Chemical industries
- Food, Health and Nutrition
- Speciality Products

Research activity

- Formulation of micro- and nano- particles: microencapsulation, bioencapsulation, stabilisation and targeted delivery
- Mechanical characterisation of micro-/nanoparticles
- Manufacture and preservation of probiotics and neutraceuticals
- Particle adhesion on surfaces
- Fouling: biofilm growth and detachment, food fouling and control
- Tissue engineering: cell mechanics, bioencapsulation, biomaterials, cell-substrate interactions and finite element analysis
- Microrheology
- Development of functional products from sustainable resources
- Understanding the contact mechanics between razor blades and skin

Other activities

- Consultancy and technical services to companies

Publications

Select publications

1. Wang, Q. G, Magnay, J. L, Nguyen, B. V, Thomas, C. R., **Zhang, Z**., El Haja, A. J., Kuiper, N. J. (2009) Gene expression profiles of dynamically compressed single chondrocytes and chondrons. *Biochemical and Biophysical Research Communications* 379**:** 738-42
2. Nguyen, V. B., Wang, C. X., Thomas, C. R. and **Zhang Z.** (2009) Mechanical properties of single alginate microspheres determined by microcompression and finite element modelling, *Chemical Engineering Science* 64: 821 – 829.
3. Yan, Y., **Zhang, Z**., Stokes, J., Zhou, Q. and Ma, G. and Adams, M. J. (2009) Mechanical characterization of agarose micro-particles with a narrow size distribution, *Powder Technology* 192**:** 122-130.
4. Nguyen, B. V., Wang, Q. G., Kuiper, J. J., El Haj, A. J., Thomas, C. R. and **Zhang, Z.** (2009) Strain-dependent viscoelastic behaviour and rupture force of single chondrocytes and chondrons under compression. *Biotechnology Letters* 31:803–809.
5. Yong, P., Paterson-Beedle, M., Liu, W., **Zhang, Z**., D.A. Beauregard, D. A., Johns, M. L. and Macaskie, L. E. (2009) A study of biofilm and non-line-of-sight bio-hydroxyapatite coatings using a Serratia sp. *Advanced Materials Research* 71-73: 741-744
6. Xue J. and **Zhang Z**. (2009) Physical, Structural and mechanical characterization of calcium shellac microspheres as a carrier of carbamide peroxide. *Journal of Applied Polymer Science* 113: 1619-1625.
7. O'Sullivan, M., **Zhang, Z**. and Vincent B. (2009) Silica-shell / oil-core microcapsules with controlled shell thickness and their breakage stress. *Langmuir* 25: 7962-7966.
8. Hu, J., Chen, H. Q. and **Zhang, Z.** (2009) Mechanical properties of melamine formaldehyde microcapsules for self-healing materials. *Materials Chemistry and Physics* 118:63-70.
9. Yue, L., Preece, J. A., York, D. and **Zhang, Z.** (2009) Microcapsules with low content of formaldehyde: preparation and characterization. *Journal of Materials Chemistry* 19**(**37**):** 6882-6887.
10. Akhtar, N., Bowen. J., Asteriadou, K., Robbins, P.T., **Zhang**, **Z.** and Fryer, P. J. (2010) Matching the nano- to the meso-scale: Measuring deposit-surface interactions with atomic force microscopy and micromanipulation. *Food and Bioproducts Processing,* **88 (**C4): 341-348.
11. Bowen, J., Cheneler, D., Walliman, D., Arkless, S. G., **Zhang, Z. B.**, Ward, M. C. L. and Adams, M. J. (2010) On the calibration of rectangular atomic force microscope cantilevers modified by particle attachment and lamination. *Measurement Science & Technology*. 21(11) Article Number: 115106.
12. Stenson, J., Ren, Y., Donald, A. M. and **Zhang, Z.** (2010) Compression testing by nanomanipulation in environmental scanning electron microscope (ESEM). *Experimental Techniques* 34**(**2**):** 60-62.
13. Yan, Y., **Zhang, Z.,** Cheneler, D., Stokes, J. R. and Adams M. J.(2010) The influence of flow confinement on the rheological properties of complex fluids. *Rheologicia Acta* 49**(**3**):** 255-266**.**
14. Wang, Q. G., Nguyen, Thomas, C. R., **Zhang, Z**., El Haj, A. J. and Kuiper N. J. (2010) Molecular profiling of single cells in response to mechanical force: comparison of chondrocytes, chondrons and encapsulated chondrocytes. *Biomaterials* 31**(**7**):** 1619-1625**.**
15. Long, Y., Preece, J. A., York, D. and **Zhang, Z.** (2010) Organic-inorganic double shell composite microcapsules. *Chemical Communications* 46**(**10**):** 1718-1720**.**

16. Nguyen, B. V., Wang, Q. G., Kuiper, N. J., El Haj, A. J., Thomas, C. R. and **Zhang, Z.** (2010) Biomechanical properties of single chondrocytes and chondrons determined by micromanipulation and finite element modeling, *J. Royal Society Interface* 7 **(**53**):** 1723-1733.

17. Chan, E.-S., Wong, S. L., Lee, P. P., Lee, J.-S. Ti, T. B., **Zhang**, **Z.**, Poncelet, D., Ravindra, P., Phan, S.-H. and Yim Z.-H. (2011) Effects of starch filler on the physical properties of lyophilized calcium–alginate beads and the viability of encapsulated cells. *Carbohydrate Polymers* 83 **(**1**):** 225-232.

18. Thomas, C. R., Stenson, J. D. and **Zhang Z**. (2011) Measuring the mechanical properties of single microbial cells.*Advances in Biochemical Engineering and Biotechnology* 124: 83-98.

19. Mercadé-Prieto, R., Nguyen, B. V., Allen, R., York, D., Preece, J. A., Goodwin, T. E. and **Zhang Z.** (2011) Determination of the Elastic Properties of Compressed Microcapsules Using Finite Element Modelling. *Chemical Engineering Science*. 66 (10) **:** 2042-2049.

20. Mercadé-Prieto, R., Allen, R., York, D., Preece, J. A., Goodwin, T. E. and **Zhang Z.** (2011) Compression of elastic -perfectly plastic microcapsules using micromanipulation and finite element modelling: Determination of the yield stress. *Chemical Engineering Science.* 66: 1835–1843.

21. Bowen, J., Cheneler, D., Andrews, J., Avery, A., **Zhang, Z.,** Ward, M. and Adams, M. (2011) Application of colloid probe AFM to the adhesion of thin films of viscous and viscoelastic silicone fluids, *Langmuir* 27 **(**18**): 11489-11500.**

22. Chan, E. S., Limb, T.-K., Voob, W.-P., Pogakub, R., Teyc, B.T., **Zhang, Z.** (2011) Effect of formulation of alginate beads on their mechanical behavior and stiffness. *Particuology* 9: 228–234.

23. Tan, Y. N.; Liu, Y.; **Zhang, Z. B**., Huang, B. Y. and Grover, L. M. (2011) Hydroxyapatite formation on surface of calcium aluminate cements. *Advances In Applied Ceramics* 110 (8): 464-468.

24. Mercadé-Prieto, R., Allen, R, York, D., Preece, J. A., Goodwin, T. E. and **Zhang Z.** (2012) Failure of elastic-plastic core-shell microcapsules under compression, *AIChEJ* 58 (9): 2674–2681.

25. Xie, M.,Olderøy, M. Ø., **Zhang, Z.**,Andreassen, J.-P.,Strand, B. L.and Sikorski, P. (2012) Biocomposites prepared by alkaline phosphatase mediated mineralization of alginate microbeads. *RSC Adv*. 1: 1–9.

26. Ioannidis, N., Bowen, J., Pacek, A. and **Zhang, Z.** (2012) Manufacturing of agarose-based chromatographic adsorbents - Effect of ionic strength and cooling conditions on particle structure and mechanical strength. *Journal of Colloid and Interface Science* 367 (1): 153–160.

27. Mercadé-Prieto, R. and **Zhang, Z.** (2012) Mechanical Characterisation of microspheres –capsules, cells and beads: a review. *J Microencapsulation* 29 (3): 277-285.

28. Pan X. M. David York, D., Preece, J. A. and **Zhang Z**. (2012) Size and strength distributions of melamine-formaldehyde microcapsules prepared by membrane emulsification. *Powder Technology* 227: 43–50.

29. Mercadé-Prieto, R., Allen, R, York, D., Preece, J. A., Goodwin, T. E. and **Zhang, Z.** (2012)Determination of the shell permeability of microcapsules with a core of oil-based active ingredient . *Journal of Microencapsulation* 29 (5) 463-474.

30. Olderøy, M. Ø., Xie, M., Andreassen, J.-P., Strand, B. L., **Zhang, Z**. and Sikorski, P. (2012) Viscoelastic properties of mineralized alginate hydrogel beads. *Journal of Materials Science: Materials in Medicine* 23(7): 1619-1627.

31. Wang, J.-Y., Yu, H.-R., Xie, R., Ju, X.-J., Yu, Y.-L., **Zhang, Z**. and Chu, L.-Y.(2012) Alginate/protamine/silica hybrid capsules with ultrathin membranes for laccase immobilization. *AIChEJ* DOI: 10.1002/aic.13834

32. Mercadé-Prieto, R., Allen, R, York, D., Preece, J. A., Goodwin, T. E. and **Zhang, Z.** (2012) Determination of failure stresses for microcapsules that rupture near the elastic regime. *Experimental Mechanics* (in press).

33. Liu, K. M., Preece, J. A., York, D., Bowen, J. and **Zhang, Z.** (2012) Measurement of the adhesion between single melamine formaldehyde micro-particles and a flat fabric surface using AFM. *Journal of Adhesion Science and Technology* (in press)

34. Mou, C-L., He, X.-H., Ju, X.-J., Xie, R. Liu, Z., Liu, L., **Zhang, Z**., and Chu, L. Y. (2012) Change in Size and Structure of Monodisperse Poly(*N*-isopropylacrylamide) Microcapsules in Response to Varying Temperature and Ethyl Gallate Concentration. *Chemical Engineering Journal* (in press).

Book chapters

1. **Z. Zhang**, J Stenson and C.R. Thomas(2009) Micromanipulation in Mechanical Characterisation of Single Particles, *Advances in Chemical Engineering,* Li J (Editor), Academic Press, pp 29-86,

2. **Z. Zhang**, D. Law and G. Lian (2010) Characterisation Methods of Encapsulates, Encapsulation Technologies for Food Active Ingredients and Food Processing. Eds: Nicolaas Jan Zuidam and Viktor A. Nedovic, Springer, pp101-126.

3. Huckle, B. D. and **Zhang, Z.** (2011) Maintenance and Protection of Probiotics. M.-T. Liong (ed.), *Probiotics, Microbiology Monographs 21*, DOI 10.1007/978-3-642-20838-6_4, # Springer-Verlag Berlin Heidelberg 2011.