



## Tian Tang

**EXPERTISE/KEYWORDS:** nanomechanics, biomolecular systems, colloidal systems, statistical thermodynamics, adhesion, molecular simulation, finite element simulation, applied mathematics

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Dr. Tian Tang is Professor in the Department of Mechanical Engineering.

### R&D CAPABILITIES

Dr. Tang's research interests interface with applied mechanics (solid mechanics, fracture, contact mechanics and adhesion, statistical mechanics) and materials science (mechanical and interfacial behavior of materials and structures at micro- to nano- scales and in biological systems). Current research areas include:

- Multi-scale modeling and simulation of nano-biomolecular hybrid materials
- Adhesion in sub-micron structures and in biological/biomimetic systems
- Statistical theory for the failure mechanism of compliant solids
- Broadly: application of mechanics and computational methods to problems in materials

### TECHNIQUES & INSTRUMENTATION SERVICES

Dr. Tang's group uses a variety of modeling tools, ranging from atomistic to continuum levels, to study materials. These modeling tools include: quantum mechanical (QM) simulation, QM-MM (molecular mechanics) hybrid simulation, molecular dynamics (MD), and continuum modeling (including analytical/semi-analytical solutions and finite element simulation). Many of the atomistic simulations performed in her group are larger (in length) and longer (in time) than any previous literature.

### INDUSTRY COLLABORATIONS

Dr. Tang's group applies computational analysis to micro- and nano- structures functional in a variety of applications: environmental, biomedical and nanotechnology. She has ongoing collaboration with Nexen A CNOOC Limited Company, which focuses on understanding molecular interactions and interfacial behaviors of asphaltenes towards development of an integrated bitumen recovery and upgrading process (collaborators including Drs. Hongbo Zeng and Qingxia Liu from Chemical Engineering, U of A). In addition, she had past industrial collaborations with Xerox on the study of wetting and adhesion of inks, and with E. I. du Pont de Nemours and Company on the separation and sorting of carbon nanotubes. Academically, Dr. Tang's computational group works widely with experimentalists to provide *in silico* material characterization and design. For example, she collaborates with Dr. Hasan Uludag (Chemical and Biomedical Engineering, U of A) on polymer-based nano carrier for gene delivery therapeutics, with Dr. Cagri Ayranci (Mechanical Engineering, U of A) on shape memory polymer composites reinforced with carbon nanofibers, and with Dr. Alidad Amirfazli (Mechanical Engineering, York University) on drop actuation using capillary tweezers, to name a few.