Multiscale Mechanics of Polymers, Soft Matter and Network Materials

- **Organizers**

Alexey Lyulin (a.v.lyulin@tue.nl), Kees Storm (c.storm@tue.nl)
Theory of Polymers and Soft Matter, Technische Universiteit Eindhoven, The Netherlands

Erik van der Giessen (e.van.der.giessen@rug.nl), Patrick Onck (p.r.onck@rug.nl)
Faculty of Science and Engineering, University of Groningen, The Netherlands

Hansohl Cho (hansohl@mit.edu), Turab Lookman (txl@lanl.gov)
Theoretical Division, Los Alamos National Laboratory, Los Alamos, NM, USA

Meredith Silberstein (meredith.silberstein@cornell.edu)
Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY, USA

- **Symposium Description**

Polymers and soft matter have been of critical importance in a broad variety of engineering and biological contexts at a wide range of scales. Recently, there have also been tremendous progresses in advanced functional network materials (e.g. vitrimers, hydrogels), that achieve excellent performance (e.g. toughness, self-healing) through the designs of atomistic, molecular and supramolecular structures within reversible or double networks. The multi-scale and multi-physical processes in these materials are strongly coupled, often resulting in highly nonlinear and emergent phenomena. To elucidate the coupled behaviors in these materials across the scales, multi-scale mechanical modeling approaches are essential.

The main goal of this Symposium is to bring together scientists and engineers from a broad variety of engineering, physics and chemistry disciplines to discuss state-of-the-art in the emerging fields of multi- scale mechanics of polymers, soft matters and network materials.

We welcome combined approaches of theoretical modeling, experimentation and computation that address (1) structure-property-function relationships, (2) macroscopic mechanical properties and their connections to micromechanical features (3) multi-scale interplays between geometry, topology and mechanics, (4) multi-physically coupled phenomena, e.g. electromagnetic fields, biological processes, chemical reactions and deformations in polymers, soft matter and network materials, and (5) advanced/additive manufacturing processes for these materials (e.g. electrospinning, 3D printing).

- **Topics (but are not to limited to)**

1. Mechanics and rheology of polymers and network materials
2. Stimuli-responsive polymers, polymeric composites, hydrogels, vitrimers, cellular materials, foams and mechanical meta-materials for new applications in engineering and biological contexts
3. Multiscale computational methods: molecular simulations (classical molecular dynamics simulations, Monte-Carlo methods), coarse-graining strategies, continuum simulations (non-conventional finite elements), *ab-initio* or density functional for polymers and soft materials
4. Mechanochemistry and multi-physically coupled deformations in polymers and soft materials

- **Invited Speakers**

We propose ~ 40 oral presentations for this symposium. Further, we have 7 confirmed invited lecturers (we may have 1-2 more invited lecturers):

Kaushik Bhattacharya, California Institute of Technology

Masao Doi, Beihang University and the University of Tokyo

Maurizio Fermeglia, University of Trieste

Jian Ping Gong, Hokkaido University

Ludwik Leibler, ESPCI Paris

Thao (Vicky) Nguyen, Johns Hopkins University

Jerry H. Qi, Georgia Institute of Technology