ESMC2025 – Mechanics of Fibrous Materials and Textiles

Organisers: Stepan Lomov (KU Leuven, Belgium), Catalin Picu (Rensselaer Polytechnic Institute, USA), Dmytro Vasiukov (IMT Nord Europe, France)

This symposium will focus on experimental, theoretical and computational aspects of the mechanics of soft and hard fibrous materials, including gels, tissue, paper and cellulose networks, nonwovens, fiber composites and textiles. These materials exhibit ~~display~~ a complex mechanical response governed by strong nonlinearities associated with large deformations, contact between fibers, fiber reorganization during loading, strong anisotropy in the presence of preferential fiber alignment, the presence of a non-linear matrix, presence of active components, etc. In composites, quasi-inextensibility in the fiber orientation is coupled with a relatively small stiffness in the fiber orthogonal direction, leading to complex behavior during forming of composite reinforcements and prepregs.

Presentations that discuss experimental, theoretical and modeling advances that establish links between the structure, topology and physics of the networks and their emerging mechanical response are welcomed. Reports that address multiphysics and multiscale aspects and make use of machine learning and other data-based approaches are of particular interest. Topics include but are not limited to:

Mechanics of textiles:

- Mechanics and multiphysics of fibres, yarns, 2D and 3D fabrics
- Deformation and forming of composite reinforcements,
- Flow (liquid and gas) through textiles

Fibrous assemblies and networks:

- Mechanics of semi-flexible fiber networks
- Mechanics of paper and cellulose networks
- Synthetic and biological active networks
- Networks with transient bonds
- Interpenetrating networks