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MECHANICS AND PHYSICS OF LAYER-LIKE, FIBROUS MATERIALS AND STRUCTURES BASED THEREON

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ABSTRACT

Materials made up either of porous fibrous networks or of matrices reinforced by fibres and appearing, at the macroscopic scale, as layers – such as paper sheets, nanopaper films or various types of epoxy-resin-based composites – are typically lightweight, strong, and often renewable as well as biodegradable; characteristics which, in times of heightened environmental awareness and distress, offer them a competitive edge against other engineering materials. Accordingly, new (often layered) structures incorporating those types of materials – such as paper- or nanopaper-based transistors, sensors, or batteries – are emerging and reshaping our technological landscape. Yet, despite the many advances, the mechanical and physical behaviour of such materials and structures is still poorly understood. This has several implications, a major one being that research and development activities on related products are still very much experiment-, trial-and-error-based, so that innovation potential remains largely untapped. Moreover, when innovation does take place, there is still considerable uncertainty surrounding the long-term performance of such products over their entire life cycle. This is true, even for century-old materials and structures such as paper sheets or paperboards, for which there is still huge room for improvement in terms of their controlled production and use. Cutting-edge theoretical, computational, and experimental research has the capability to address these challenges and to lead us to new generations of products and applications based on such layer-like, fibrous materials and structures based thereon.

This symposium is a forum for scientists and engineers working in the field of mechanics and physics of layer-like, fibrous materials and structures based thereon. The submitted contributions should address recent theoretical, computational, and/ or experimental advances.

Topics of interest include: • Experimental determinations on hierarchical, multiscale organization (e.g., high-resolution images of cellulose fibrils) • Experimental determinations on mechanical response (e.g., time-independent and -dependent elasticity or elastoplasticity), • Experimental determinations on physical response (e.g., thermal conductivity, electrical conductivity, dielectric function, water vapour diffusivity or permeability), • Experimental determinations on coupled physical response (e.g., piezoelectrical), • Theoretical modelling and computational implementation (e.g., macro-mechanics, micro-mechanics, or hybrid approaches), • Comparison of theoretical predictions with experimental determinations, • Setups for experimental determination of mechanical, physical, or coupled responses