

Friction in and with textile materials: from the fibre to the surface fabric

Marie-Ange Bueno

Université de Haute Alsace, Laboratoire de Physique et Mécanique Textiles, Mulhouse, France

Fibrous materials present different scales from the fibre, the yarn to the surface fabric obtained in most of cases by weaving or knitting.

Friction occurs at each scale between fibres inside the yarn, between yarns inside the fabric. These friction phenomena are fundamental in textile materials during their process because the textile cohesion comes from friction. Moreover, the origin of their interesting mechanical properties is due to friction mechanisms: low bending rigidity, drapability etc for very light materials.

During its life a textile fabric is in interaction with different materials and very usually with skin. Therefore the fabric is touched to evaluate its tactile rendering. The touch evaluation mechanisms are not totally understood but a lot of works have been done more or less recently by i) the identification of the different kinds of mechanoreceptors, their sensitivity in qualitative and quantitative terms, ii) the origin of the sensitivity to textures with the duplex theory of tactile revealing that is a combination of roughness (needed movement) and vibration sensitivities (needed a movement) and iii) the role of finger texture (fingerprints) in the texture evaluation including textile fabrics. For industrial applications the touch sensitivity comprehension is fundamental for material design, and especially textile fabrics, needed their characterization in a tactile point of view and more recently for the simulation of textures by tactile stimulators.