Title : Beyond Kirchhoff's and Mindlin's theories for fibrous shells. New approaches.

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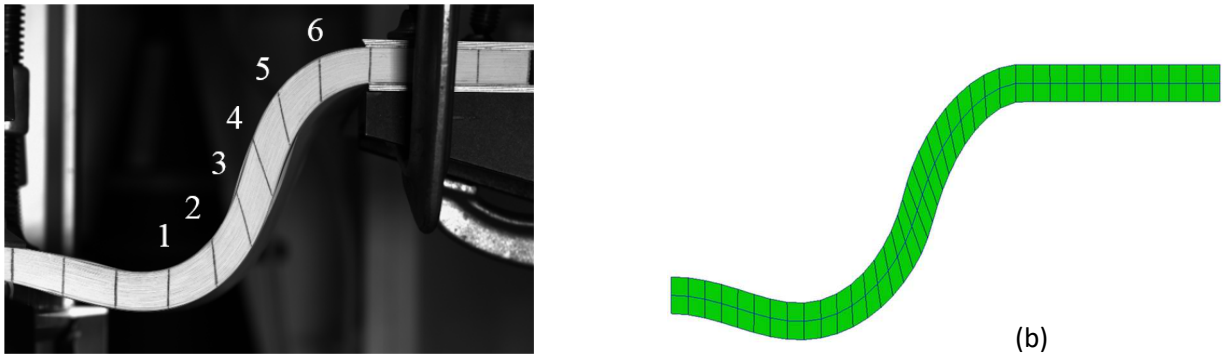
When the structure is thin, fibrous materials are modeled by shells in a large part of deformation analyses. Given the fibrous nature of the reinforcement, some local slippage between the fibers may occur. This makes the mechanical behavior very specific and different of those of a continuous material (such as metals) [1,2]. In particular, the bending behavior is specific and must be decoupled from tensile behavior. Moreover, the classical shell kinematics are not valid. The bending behavior is much modified by the possible slippage between fibres [3, 4]. The kinematics of deformation, in particular the rotations of the normal are mainly driven by the quasi-inextensibility of the fibers. The bending stiffness of the fibers also plays an important role. The present Ph. D. aims to propose modelings of the deformation of fibrous reinforcements by specific approach. The works of Ahmad will be considered [5]. This approach concerns both thin and thick reinforcements. It is in this latter case that the kinematics of the deformation in the thickness is particularly interesting. The objective is also to provide a more efficient alternative to the 3D finite element modellings that are used to thick 3D materials [6].
The aim of this Ph.D. is to propose, develop and validate alternative theories of shells that can reflect the behaviour of fibrous shells. The work will be based on preliminary studies carried out at LAMCOS [7, 8]



(a) (b)

Fig. 1. Bending on a parallel fiber shell: (a) Experiment. (b) Specific shell approach

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Short CV

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