

HOMOGENIZATION OF THE CONSTITUTIVE PROPERTIES OF COMPOSITE BEAM CROSS-SECTIONS

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When modelling beam-like objects made of composite materials using a beam theory, homogenized stiffness coefficients must be obtained. In [1, 2], analytic expressions for these are obtained by comparing the solutions of some extension, bending and torsion problems for the directed curves with the corresponding results obtained for three-dimensional rods. In [1], the authors provide general expressions for the determination of these coefficients for multilayered beams.

This work consists in the study of a homogenization procedure of the stiffness coefficients for hollow circular cross-sections with several layers. This will help in the study of the constitutive behavior of unloaded shafts of endoscopes. An experimental campaign was carried out at KARL STORZ GmbH & Co. KG (Tallinn, Estonia) in order to evaluate the stiffness coefficients concerning the bending and torsion of such devices. Experimental results will be compared to the numerical ones obtained from nonlinear Cosserad beam model simulations.

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