

Stiffness and strength tailoring of a hip prosthesis made of advanced composite materials

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Abstract-

This work is concerned with the design of hip prostheses using advanced fiber reinforced composite materials. The major focus of the study is to evaluate how the stiffness and strength of composite hip prostheses can be affected by variations in ply orientation and stacking sequence for a selected manufacturing method. An excellent agreement was found between the measured strain data and the numerical calculations. Using the program, parametric studies were performed. It was found that an optimal design of hip stems can be achieved by using advanced fiber-reinforced composite materials, but great care must be taken when selecting the appropriate ply orientation and stacking sequence for a chosen fabrication method.

Index Terms- Biomechanics, Composite Materials, Finite Elements, Prosthesis

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