

## **Analysis of the hollow structure with functionally gradient materials of Moso bamboo**

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Bamboo is a fiber-reinforced bio-composite with superior structural behavior. Its hollow structure as well as bamboo fiber's gradient distribution is the embodiment of its superior construction. To validate this, tensile tests were performed on bamboo test pieces and the corresponding volume fractions of fiber and parenchymatous tissue were measured. The tensile modulus of elasticity of bamboo fiber and parenchymatous tissue were estimated according to the linear equations obtained by regression analysis. A hollow model and a solid model with the equivalent volume were built, the the models wrer solved by analytic method and numerical method to make comparative on their mechanical behavior. In order to verify the advantage of gradient distribution of fiber, models composed of fiber and parenchymatous tissue with different fiber distribution were built and solved based on numerical method. Results show that under condition of using the same volume of materials, the hollow structure as well as fiber gradient distribution make the mechanical properties of bamboo structure perfect.

**Keywords:** Moso bamboo, Tensile tests, Hollow structure, Gradient distribution