

Accepted Manuscript

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PII: S0263-8223(17)31232-1
DOI: <https://doi.org/10.1016/j.compstruct.2017.12.044>
Reference: COST 9201

To appear in: *Composite Structures*

Received Date: 17 April 2017
Revised Date: 29 October 2017
Accepted Date: 20 December 2017

Please cite this article as: Jin, X., Hou, C., Fan, X., Sun, Y., Lv, J., Lu, C., Investigation on the static and dynamic behaviors of non-pneumatic tires with honeycomb spokes, *Composite Structures* (2017), doi: <https://doi.org/10.1016/j.compstruct.2017.12.044>

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Investigation on the static and dynamic behaviors of non-pneumatic tires with honeycomb spokes

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Abstract: Non-pneumatic tires (NPTs) have wide application prospects due to their advantages of no run-flat, no need of air pressure maintenance, and low rolling resistance. In this paper, the static and dynamic behaviors of NPTs with different honeycomb spokes were investigated. Based on the static behavior of three types of NPTs with the same cell wall thickness of honeycomb or the same reference load carrying capacity, it is shown that the maximum stresses in spokes and tread of a NPT are much lower than that of traditional pneumatic tires, but its load carrying capacity is higher than the latter. In comparison with the dynamic behavior of three types of NPTs designed with the same load carrying capacity, it is found that the stress level in spokes and tread under dynamic loading are higher than that under static loading. The rolling resistance of NPTs with the smallest cell expanding angle is lowest, which is due to the lowest mass and smallest deformation of honeycomb spokes. Taking all

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