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Multiscale tribo-mechanical analysis of natural fiber composites for manufacturing applications

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ABSTRACT

This paper aims to investigate the tribo-mechanical behavior of natural fiber reinforced plastic (NFRP) composites with specific consideration of the multiscale complex structure of natural fibers. Understanding the multiscale tribo-mechanical performances of these eco-friendly materials can lead to a better design of their manufacturing processes. Nanoindentation and nanoscratching experiments are conducted on flax fibers reinforced polypropylene composites using a triboindenter at a specific contact scale generated by the tip indenter radius (100 nm). Results confirm the significant effect of the geometric contact scale on the flax fibers stiffness. Moreover, flax fibers friction shows a multiscale behavior where the mechanisms of nano-friction are vastly different from those of micro-friction, which is related to the physical phenomena arisen at each scale.

KEYWORDS

Natural fiber composites; Nanoindentation; Scratch test; Multiscale friction.

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