Damping and wear behavior of 3D woven reinforced structural composite for automotive leaf spring application

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Abstract

The development of different textile structures and their composites for automotive leaf spring applications were considered. Owing to the good mechanical performance of epoxy, it was used as the matrix material in advanced structural applications. Initially, the different textile reinforcement architectures considered were in the form of E-glass unidirectional (UD) tow, bidirectional (2D) plain weave, and 3D woven solid orthogonal and interlock structures. The effect of reinforcing structure on the damping and wear performance of the composites was analyzed for their utilization in automotive leaf springs. Later, four different 3D orthogonal structures were developed to investigate the influence of binder percentage on their damping and wear performance. The damping performance was analyzed in terms of free vibrations, hysteresis damping, and dynamic mechanical properties. A wear analysis was carried out to determine the effect of different reinforcing elements on the friction and specific wear. The 3D reinforced composites considered exhibited the optimum damping and wear behavior.

Keywords: 3D woven structural composites, damping behavior, wear performance, automotive leaf spring