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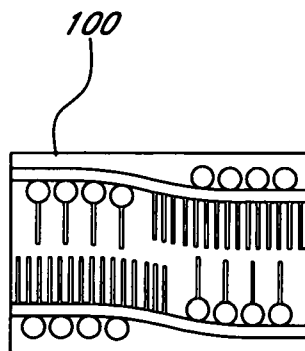
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(54) **Title:** THREE-DIMENSIONALLY REINFORCED MULTIFUNCTIONAL NANOCOMPOSITES



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(57) **Abstract:** A three-dimensional composite reinforcement, a three-dimensionally reinforced multifunctional nanocomposite, and methods of manufacture of each are disclosed. The three dimensional reinforcement comprises a two dimensional fiber cloth upon which carbon nanotubes have been grown, approximately perpendicular to the plane of the fiber cloth. The nanocomposite comprises the three-dimensional reinforcement and a surrounding matrix material. Examples illustrate improvements in the through-thickness mechanical, thermal, and electrical properties of the nanocomposite, in addition to substantial improvements in geometrical stability upon temperature changes and vibrational damping, compared to baseline composites reinforced with the two-dimensional fiber cloth alone. Embodiments of the nanocomposite may also be configured to perform multiple functions simultaneously, such as bearing a thermal or mechanical load simultaneously or bearing a mechanical load while also monitoring the state of damage within the nanocomposite.