

in Athletic Footwear

Biomechanics of the foot and improving mobility

Key Takeaways

- 1) **Why composites?** Composite materials offer the greatest strength-to-weight ratio for the most efficient use of materials in footwear. Toray PMC CFRT® thermoplastic composite materials are ideal for footwear engineering, allowing designers to tailor the range of foot motion through fiber replacement, resin selection, and component design. Similar to a continuous bridge, Toray PMC CFRT® thermoplastics composite laminates provide engineered strength throughout your design.
- 2) **Why thermoplastics?** Thermoplastics are recyclable and have properties which lend to high-volume manufacturing with cycle times similar to injection molding. Thermoplastics have greater impact and chemical resistance with relatively low tooling costs.
- 3) *“.....Toray PMC CFRT® thermoplastic laminates are able to repeatedly resist abnormal motion in a spring-like manner due to the unique resilience of the materials. Toray PMC CFRT® laminates allow for effective, comfortable deceleration of abnormal motion with every foot strike, and spring-like energy return as the foot leaves the ground.”* (This fact was proven by Drs. Olson and Ritchie, published in JAPMA in 1995.)
- 4) Current concepts of foot and gait function are deficient, and do not consider more recent discoveries in anatomy and neuromechanics.
- 5) Muscle, fascia, and ligaments around a joint act in synergy. Each provides a fraction of stabilizing tension to a joint and the larger system. Altering the contribution of tension in the viscoelastic tissues – in synergy – produces controlled motion.
- 6) The mass of the kinetic chain- the viscoelastic tissues- store potential energy in the gravitational field to supplement force produced by muscle during gait. **There is energy stored in a stable joint/joint system.**
- 7) The spine drives gait, the foot interfaces with the substrate to adapt to the topography and maximize force transfer between the substrate-kinetic chain-gravitational field synergy.
- 8) Over time, the viscoelastic tissues of the foot succumb to chronic stress and load, diminishing efficiency, ultimately producing dysfunction and pain. Composite materials, in the right configuration, can restore foot function, improve efficiency, and improve performance.



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FURTHER READING

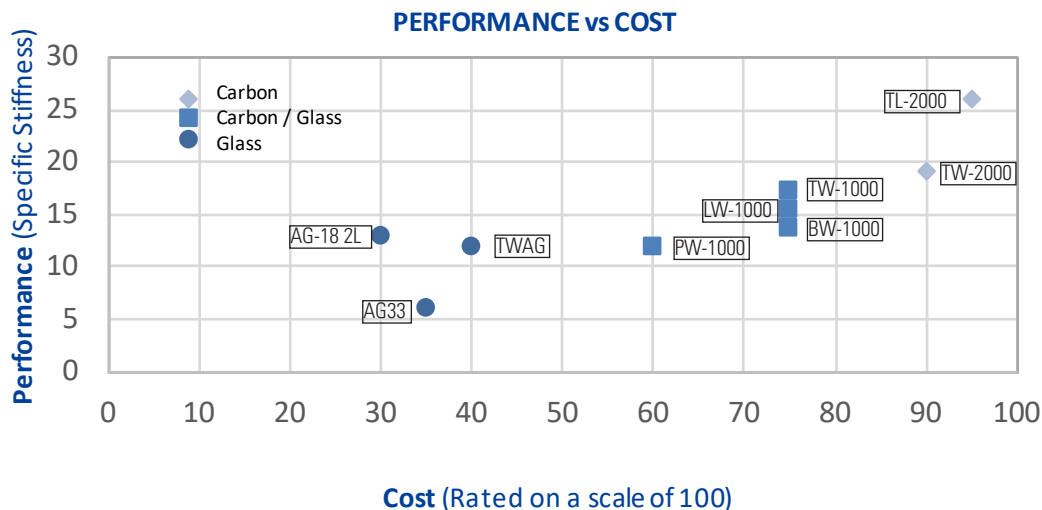
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