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## Stress-relaxing composite ligature wires: Formulations and characteristics

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### ABSTRACT

A stress-relaxing composite ligature was developed that has both mechanical and esthetic characteristics that make it attractive for use in orthodontics. The neutrally-colored polymer-polymer composite was created by encasing ultra-high molecular weight poly(ethylene) fibers in a poly(n-butyl methacrylate) polymer, which was formulated from a polysol and an optimal benzoin ethyl-ether concentration. The resulting composite ligature exhibited a tensile strength more than twice that of dead-soft stainless steel ligature, and a stress-relaxation decay significantly greater than stainless steel ligature. With these characteristics, the material could be used as an orthodontic ligature when tooth movement with negligible friction due to ligation is desired. A Maxwell-Weichert model predicted the load-decay profiles that ultimately resulted in the general loss of frictional forces with time.

**KEY WORDS:** Composite, Ligature, Mechanical properties, Stress relaxation.

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