

A light-weight fully thermoplastic fiber-reinforced composite is introduced made of a polyolefin matrix with ultra-high molecular weight polyethylene (UHMWPE) fibers as reinforcement. Excellent adhesion of the UHMWPE fibers within a pre-impregnated material (prepreg) is achieved by a functional plasma polymer allowing textile processing into fabrics and thermoforming of the composite.



Fully Thermoplastic Fiber-Reinforced Composite

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Empa's laboratory for Advanced Fibers has developed a fully thermoplastic fiber-reinforced composite that consists of a polyolefin plastomer matrix, reinforced with ultra-high molecular weight polyethylene (UHMWPE) fibers. The interfacial affinity of both polyolefins was enhanced by coating the filaments with a nanometer-scale plasma polymer film comprising polar groups based on a reel-to-reel process. The plasma-activated

yarn was subsequently overjacketed with the matrix material and woven to a fabric. A stack of such fabrics was finally put in a hot-press and formed to a composite laminate. By confining the extent of hot compaction it is possible to tune the rigidity of the material, where different regions have more of a stiff or a compliant character. Thermoforming even allows three-dimensional structures without breaking the reinforcing filaments.

