

Fused deposition modeling of a continuous carbon fiber reinforced composite using
fiber/matrix individual supply system

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We have developed a method for the three-dimensional (3D) printing of a continuous fiber-reinforced thermoplastic based on fused-deposition modeling. The technique enables direct 3D fabrication without the use of molds and may become the standard next-generation composite fabrication methodology. A thermoplastic filament and continuous fibers were separately supplied to the 3D printer and the fibers were impregnated with the filament within the heated nozzle of the printer immediately before printing. Polylactic acid was used as the matrix while carbon fibers were used as the reinforcement. The thermoplastic reinforced with unidirectional carbon fiber showed mechanical properties superior to that of unreinforced thermoplastic. Continuous fiber reinforcement improved the tensile strength of the printed composite relative to the values shown by conventional 3D-printed polymer-based composites.