

Additive nanomanufacturing by femtosecond laser direct writing

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ABSTRACT

Precise synthesis, assembly and structuring of functional nanomaterials into two- or three-dimensional (2D/3D) micro/nano-architectures is highly desirable for additive nanomanufacturing in numerous fields but remains tremendous challenges. In this talk, we will discuss our recent endeavors on the work towards the synthesis, assembly and 3D structuring of various nanomaterials including carbon nanomaterials, transition metal sulfide and oxides through femtosecond laser direct writing techniques. High spatial resolution and tight orientation control of the low-dimensional nanomaterials have been successfully achieved. Notably, one-dimensional nanomaterials such as CNT, ZnO nanowires (NW) can be controlled to regularly align in any desired direction along the laser scanning direction in 3D microstructures. Moreover, based on the laser direct writing techniques, we have fabricated series of functional nano-devices ranging from polarization-resolved UV detectors and gas sensors to microelectronic devices, which is promising for the construction of high-performance integrated system. This work could pave a way for precise growth, assembly and integration of functional nanomaterials into arbitrary desired 3D micro/nanostructures for a broad range of integrated system applications, such as NW-based integrated circuits, sensors, MEMS, and metamaterials.

Keywords: Femtosecond laser, Carbon nanotube, ZnO nanowire, Hydrogels, Additive nanomanufacturing