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Novel Fabrication and Enhanced Photosensitivity of Selenium Filament Arrays by Optical-Fiber Thermal Drawing DAOSHENG DENG, N. ORF, A. ABOURADDY, Y. FINK, Massachusetts Institute of Technology — Structures with high aspect ratio and nanometer cross-sectional dimensions have been the subject of recent studies. These nanometer-scale wire structures are typically processed through a bottom-up approach that yields limited wire lengths lacking global orientation and presenting challenges to handling and electrical contacting. Here, we report a novel physical phenomenon in which a cylindrical shell undergoing a scaling process evolves into an ordered array of filaments upon reaching a characteristic thickness. We propose a fluid front instability mechanism to account for the observed phenomena. The fleeting evolution of fluid breakup from a thin film to a filament array is captured in the frozen state by a thermal drawing process which results in extended lengths of solid sub-100nm filaments encapsulated within a polymer fiber. Furthermore, we demonstrate that the electrical connectivity of centimeter-long filament arrays to external circuitry is readily achieved by contacting the fiber ends, allowing one to study their electrical and optoelectronic properties. Enhanced photosensitivity of filaments is observed compared to a selenium film. This approach offers unique opportunities for fabrication of nanometer scale devices of unprecedented lengths allowing simplified access and connectivity.

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