Growth of Hierarchical Nanotree Arrays via a Flame Vapor Deposition Process

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Our group has previously demonstrated the vertical aligned nanowire (NW) growth of WO_x and MoO_x by a wire feeder incorporated flame vapor deposition (FVD) system. In this study, we designed a route to integrate a 1D nanostructured backbones and epitaxial nanowires branches along omnidirectional dimension into ultimate 3D hierarchical nanotree array architectures. To create the nuclei for branches growth on aligned NWs, a tungsten wire source was flashed in and out so that the vapor concentration increases sharply in order to initiate heterogeneous nucleation. Depend on the frequency and interval of wire flame in and out, the number and size of branches grown on main NW trunks could be adjusted. This study demonstrate a facile approach for the growth of 3D nanostree array thin films. The atmospheric, fast growth rate processed by this wire feeder incorporated FVD system offers a promising strategy for 3D hierarchical nanostructures growth.