

## Highly-Ordered Supportless Three-Dimensional Nanowire Networks with Tunable Complexity and Interwire Connectivity for Device Integration

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The fabrication of three-dimensional assemblies consisting of large quantities of nanowires is of great technological importance for various applications including (electro-) catalysis, sensitive sensing, and improvement of electronic devices. Because the spatial distribution of the nanostructured material can strongly influence the properties, architectural design is required in order to use assembled nanowires to their full potential. In addition, special effort has to be dedicated to the development of efficient methods that allow precise control over structural parameters of the nanoscale building blocks as a means of tuning their characteristics. This paper reports the direct synthesis of highly ordered large-area nanowire networks by a method based on hard templates using electrodeposition within nanochannels of ion track-etched polymer membranes. Control over the complexity of the networks and the dimensions of the integrated nanostructures are achieved by a modified template fabrication. The networks possess high surface area and excellent transport properties, turning them into a promising electrocatalyst material as demonstrated by cyclic voltammetry studies on platinum nanowire networks catalyzing methanol oxidation. Our method opens up a new general route for interconnecting nanowires to stable macroscopic network structures of very high integration level that allow easy handling of nanowires while maintaining their connectivity.

