Functional Inorganic and Organic Nanofiber Materials from Earth-Abundant Resources and Their Application

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Abstract

Today, highly crystalline nanofibers materials made of earth-abundant resources have attracted much attention towards widely ranged device applications from electronics to bio sensing due to not only their inexpensiveness but also the excellent electron, thermal and ionic transport properties in confined nanospace and the mechanical flexibility. Here we present the design concept of functional nanofiber materials and their device applications. The self-assembling growth mechanism of single crystalline inorganic nanofibers such as metal oxide nanowires and silicon nanowires are shown with the rational concept to design their structure, composition and functionality. Using the synthesized functional nanofiber materials, we demonstrate the prominent performance of various nanodevices including memristor, thermoelectric conversion device, and molecule recognition device. On the other hand, we show that the cellulose nanofiber based transparent nanopaper extracted from wood chip exhibited the non-volatile memory effect with its ultra-flexible and the biodegradability in natural soil. These results offer the platform to create the innovative nanodevices using the earth-abundant nanomaterials.

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Keywords: metal oxide nanowires, silicon nanowires, cellulose nanofibers, nanodevice