

Abstract Submitted
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Silicon nanoporous pillar array: template for fabricating silicon-based nanocomposites with enhanced physical properties¹ XIN JIAN LI, Zhengzhou University, China, XIAO NAN FU, Zhengzhou University, China, HAI JUN XU, Zhengzhou University, China, WEI FENG JIANG, Zhengzhou University, China — A triple hierarchical structure, silicon nanoporous pillar array (Si-NPA), was formed on silicon wafers by a hydrothermal method. The structure of Si-NPA is characterized by the regular array of micron-sized silicon pillars, quasi-identical nanopores densely distributing over each pillar, and silicon nanocrystallites composing the walls of the nanopores. Utilizing the excellent structural regularity and high chemical reactivity of Si-NPA, patterned nanocomposites of CdS, carbon nanotubes (CNTs), Au, and Fe₃O₄/Si-NPA were fabricated. Their element compositions, morphologies and microstructures were characterized. Ideal physical properties of I-V curve in CdS/Si-NPA heterojunction, field emission in Si-NPA, CNTs/Si-NPA, Au/Si-NPA, and humidity/gas sensitivity in Fe₃O₄/Si-NPA were observed and the corresponding mechanisms were analyzed. These results indicate that Si-NPA could be employed as an ideal template to assembly silicon-based functional nanosystems, and might find multiple applications in fabricating novel electronic devices.

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