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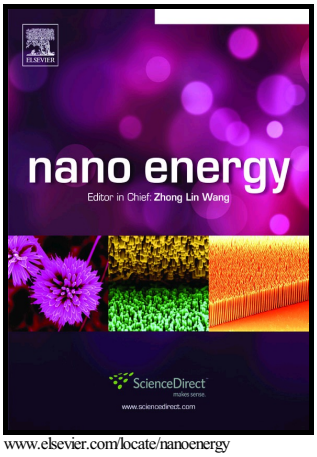

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Uniformly assembled vanadium doped ZnO microflowers/ bacterial cellulose hybrid paper for flexible piezoelectric nanogenerators and self-powered sensors

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Key words: vanadium doped ZnO, bacterial cellulose, flexible nanogenerators, self-powered, motion sensor.

Abstract

As good alternatives for conventional rigid piezoelectric materials, piezoelectric nanocomposites combining piezoelectric materials and flexible polymer matrix demonstrate great potential for flexible nanogenerators. Rational design of the hybrid structure is important for performance optimization of piezoelectric nanocomposite. Here, we designed a hybrid piezoelectric paper through uniform assembly of vanadium doped ZnO (V-ZnO) mircoflowers in bacterial cellulose (BC) matrix by a in situ synthesis method. Different from pure ZnO where the c-axis of crystalline need to be oriented in order to get improved piezoelectric output, V-ZnO demonstrate ferroelectric property, which is prerequisite for poling with external high voltage in enhancing the output performance. The resultant hybrid paper demonstrated excellent flexibility and was used to fabricate flexible piezoelectric nanogenerators (PENGs). With excellent mechanical strength and durability, the V-ZnO/BC hybrid paper-based PENGs can work as self-powered motion sensors, which are capable of monitoring page-turning motions when integrated with pages of books. The V-ZnO/BC hybrid paper based PENGs are lightweight and inexpensive, which demonstrate promising