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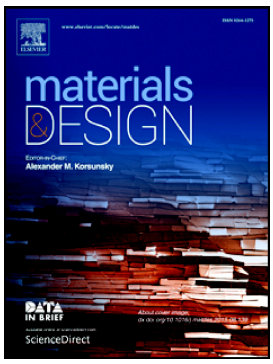

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High-performance BCTZ nanowires-based energy harvesting device and self-powered bio-compatible flexion sensor

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Abstract

With excellent piezoelectric properties, $(Ba_{0.85}Ca_{0.15})(Ti_{0.9}Zr_{0.1})O_3$ (BCTZ) has been widely used in actuators, capacitors, sensors, etc. In this work, we fabricated BCTZ nanowires (NWs) by using sol-gel based electrospinning technique. By applying plate-electrode and parallel-electrode collectors, random BCTZ NWs (R-NWs) and well-aligned BCTZ NWs (A-NWs) were obtained. X-ray diffraction and high resolution transmission electron microscopy indicated that the NWs have good crystallinity. Furthermore, two flexible energy harvesting devices (EHDs) based on A-NWs and R-NWs were fabricated and their piezoelectric properties were measured. Under a load resistance of 1 MΩ, the output power of the R-NWs-based EHD is only ~0.95 μW while that for A-NWs-based EHD can reach up to ~2 μW, which can easily light a commercial light-emitting diode. Finally, we further demonstrated that the EHD could function as a non-invasive self-powered bio-compatible flexion sensor to apperceive the human knuckle flexion/extension movements.

Keywords: Nanowires; Flexible; Energy harvesting; Electrospinning; BCTZ.

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