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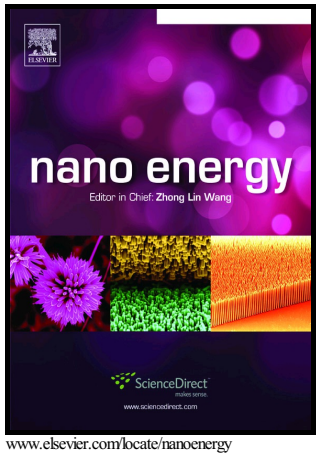

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On-vehicle triboelectric nanogenerator enabled self-powered sensor for tire pressure monitoring

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ABSTRACT

Tire pressure monitoring systems (TPMS) are becoming increasingly important in an effort to ensure safe and efficient use of tires in the automotive sector. There is growing interest in using energy harvesting technologies to provide power for TPMS because battery supply has serious drawbacks such as replacement difficulty, limited durability and environmental pollution. In this study, we proposed an on-vehicle magnetically triboelectric nanogenerator (V-TENG) scavenging rotating energy from tires and serves as a direct power source for tire pressure sensor. The V-TENG incorporates two different triboelectric materials with opposite polarities based on contact-electrification effect. The unique advantages of the seesaw balance structure are to overcome the influence of a large centrifugal force at high operating speed as well quadruple the efficiency contact areas of a miniaturized device. Noncontact magnets mounted on the brake calliper periodically actuate swing motion of multiple V-TENGs placed on the wheel hub. The V-TENG effectively generates electrical energy at the alarm temperature through a thermally stable polymer films. High electrical output has been achieved among the wide ranges of rotation speed and magnetic force through systematically experiments test. Meanwhile, there is no obvious decrease in the output voltage of the V-TENG after continuous working for about 12 h. Moreover, a battery-less pressure sensor was enabled by a single V-TENG device to measure