Bio-inspired flexible vibration visualization sensor based on piezo-electrochromic effect

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Abstract

As is well-known, the vibration exists everywhere in our daily life, which brings numerous damage to structure health and physical safety. However, the real-time monitoring of omni-directional vibrations, stress and strain remains a big challenge [1]. Here, we proposed a flexible, cost-effective, passive vibration-visualization sensor based on heterostructural piezo-electrochromic effect [2]. In this work, an all-inorganic, flexible $PbZr_{0.52}Ti_{0.48}O_3$ (PZT) piezoelectric thick film was prepared by sol-gel method based on two-dimensional mica substrates, whose open-circuit voltage and short-circuit current density reached respectively 120V and 150μA cm^{-2} [3]. The WO_3 film deposited using DC magnetron sputtering was assembled as electrochromic device, which exhibited large transmittance modulation up to 60% and prompt coloration response. The integrated vibration-visualization sensor can convert external pressure signal into real-time color change by a rectifier [4]. Such systems are promising for applications in passive wearable/attachable vibration-monitoring devices for collapse-proof systems of bridges, the structure safety of aircraft wing and human physiological health monitoring.

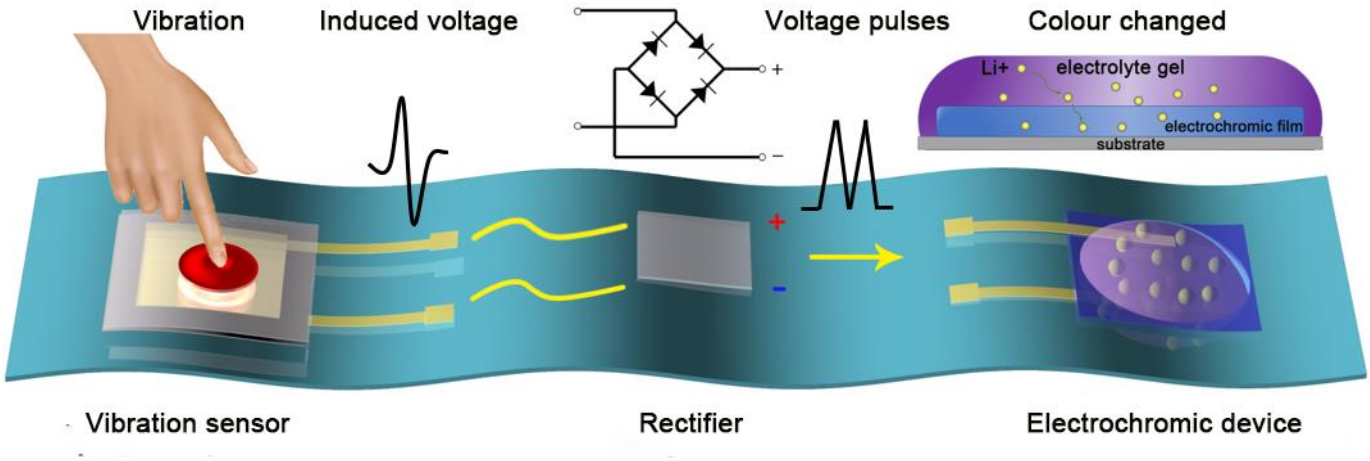

Figure 1: Illustration of the Flexible passive vibration-visualization sensor.

References

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