**Enhanced stretchability of piezoelectric polymer by boron nitride nanosheets**

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**Introduction**.

Poly(vinylidene fluoride) (PVDF) is commonly used for making piezoelectric sensors and energy harvesting devices. However, its low strength and extension strain limits the adoption of this material by emerging wearable technologies. Some recent works have been focused on preparing cutting special patterns to increase the elongation of PVDF film.

**Aims**.

To increase the stretchability of piezoelectric polymer to cater the need for conformability of sensors and energy harvest devices.

**Methods**.

PVDF/Boron nitride nanosheets (BNNSs) nanocomposites were electrospun into nanofibres. Commercial BN powder with urea as agent was processed using ball milling method operating at 400 rpm for 20 h at ambient temperature. The few-layer h-BN was characterised by SEM, TEM and EDX. Tensile tests and piezoelectric property measurements were conducted for characterising membrane properties.

Discussion.



Fig. 1. Tensile stress strain curves and electric output while the membrane experiences impact loading

The neat PVDF showed maximum tensile stress of 0.6MPa and maximum tensile strain of 40%; with 1 wt% of BNNSs, the strength increased to 6 MPa and the elongation reached 110%. It represents enhancement of 900% and 175% in strength and elongation, respectively. The incorporation of BNNSs showed no or even a slight improvement in output current and output voltage as can be seen in Fig. 1. The PVDF/BN1.5 generated output voltage around 0.8V and output current around 0.8 μA. With significantly improved stretchability, the piezoelectric nanofibres will have more broad applications.

**Conclusion**.

The work presents a simple method of increasing the stretchability of PVDF nanofibre membrnaes with the inclusion of small amount of BNNSs. In the meantime, the piezoelectric performance was not affected or showed slight increase with the presence of 1~1.5wt% of BNNSs [1].

**References.**

1. Zhang, J., Liu, D., Han, Q., Jiang, L., Shao, H., Tang, B., Lei, W., Lin, T. & Wang, C. (2019) Mechanically stretchable piezoelectric polyvinylidene fluoride (PVDF)/Boron nitride nanosheets (BNNSs) polymer nanocomposites. Compos. Part B., 175, 107157.

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