Nanocomposite piezoelectric fibers

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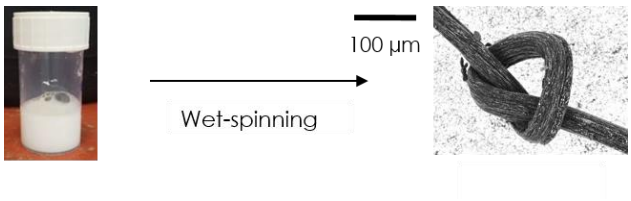

Figure 1: From nanoparticle suspensions to nanocomposite piezoelectric fibers (SEM photography).

Piezoelectric conversion of mechanical vibrations into electrical energy is a promising approach to power embedded electronics and to develop new sensing technologies. Conventional piezoelectric materials are usually under the form of thin films or brittle crystals. Having piezoelectric materials under the form of flexible fibers would allow their implementation in smart textiles and new functional structures.
Inorganic fibers have good piezoelectric properties but are highly brittle. Organic polymer fibers are flexible but do not yet compete with inorganic materials in terms of piezoelectric efficiency. Here we present a new generation of nanocomposite fibers that combine the deformability and robustness of polymers and the high piezoelectric properties of inorganic nanoparticles. We use poly(vinyl alcohol) (PVA) as polymer because of its good mechanical properties and spinnability. The nanocomposite fibers are spun by a wet-spinning process and loaded with ZnO or $BaTiO_3$ piezoelectric nanorods. The anisotropic shape of the particles is used to promote the mechanical stress transfer from the PVA matrix to the piezoelectric particles.[1] We present how the fibers can be assembled into flexible films and their first electromechanical characterizations.

References

[1] Malakooti, M. H., Julé, F. & Sodano, H. A., Journal, ACS Appl. Mater. Interfaces, 10 (2018) 38359–38367

Figures