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# Gold nanofluid as a promising enhancer for intrusion-extrusion triboelectric effect in hydrophobic nanopores

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Solid-liquid triboelectric nanogenerators (S-L TENG) are an emerging solution for harvesting dispersed mechanical energy and converting it to electricity. They could be utilized in the automotive industry as a part of shock absorbers or suspensions. The generation of electrical charge during contact and separation of various materials, along with electrostatic induction, is the main principle of TENG operation. A particularly interesting phenomenon is the intrusion-extrusion of non-wetting liquid inside and outside of a porous structure. Under certain applied pressure, the liquid can penetrate pores and wet the surface inside. Lowering the pressure will cause the release of liquid and dewetting of the hydrophobic surface. The amount of electricity generated by such a work cycle is determined by multiple conditions such as materials composition, pore sizes, pH, and temperature. In case of porous materials, metal-organic frameworks (MOFs) and hydrophobic silica are quite common objects for this study. Their well-developed specific surface expands the contact area between both components, therefore improving energy density and overall efficiency of TENG-based devices. Pure water, as a non-wetting liquid, exhibits low voltage values for triboelectrification. An interesting solution for this issue can be nanofluids, which are colloidal solutions of nanoparticles (NPs), stabilized in a liquid. Conductive nanofluids, containing metallic NPs, are great candidates for liquid components in S-L TENG. They can provide higher charge mobility and better polarization. Structure, size, and composition of nanoparticles can be tuned to achieve higher electrical signals. We propose a triboelectric system based on nanoporous hydrophobic silica and gold nanofluid. Preliminary results show voltage generation during the intrusion and extrusion of nanofluid, and the size of nanoparticles affects the amount of generated power. Utilizing a single electrode setup, the system is fairly convenient for future development and potential applications in shock absorbers.

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