

# High-resolution TENGs for earthquakes ground motion detection

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## Abstract-

Towards a deeper consciousness of the human being in preserving the natural environment of our planet, huge effort is nowadays being exerted by scientists all over the world to use green and free energy. The main motivation for this effort is to protect humanity, today and in the future, from the big natural disasters that often affect the poorest areas of the globe. In this work, TENGs (triboelectric nanogenerators) with an&nbsp;seismic waves&nbsp;with global connectivity to the&nbsp;flame retardancy, and frequency-dependent sensitivity were fabricated with different materials such as Paper, Polyvinylalcohol (PVA), Polyvinylidene fluoride (PVDF) and PDMS. The TENGs based on PVA10PPA-PEI/PVDF exhibited the highest sensitivity of 280&nbsp;Hz and the ones based on Paper/PDMS were very low cost and easy to manufacture. Pulses, artificially generated with an electro-mechanical machine operating in fatigue mode, were remotely transmitted by using LoRa communication protocol and could be monitored in the TTS (The Thing of Stack) platform. Finally, a realistic application of SEIS-TENG was carried out by simulating earthquakes with a triaxial shaking table and the seismic waves were measured using SEIS-TENGs. Interestingly, they exhibited a similar response to the acceleration, velocity, and displacement, and with today&rsquo;s commercial&nbsp;

**Index Terms-** High sensitive Triboelectrical Energy Nanogenerators (TENGs); Earthquakes, scalograms, and spectrograms; Internet of things (IoT); LoRa (Long Range) protocol; Wireless systems; Hazardous environments

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