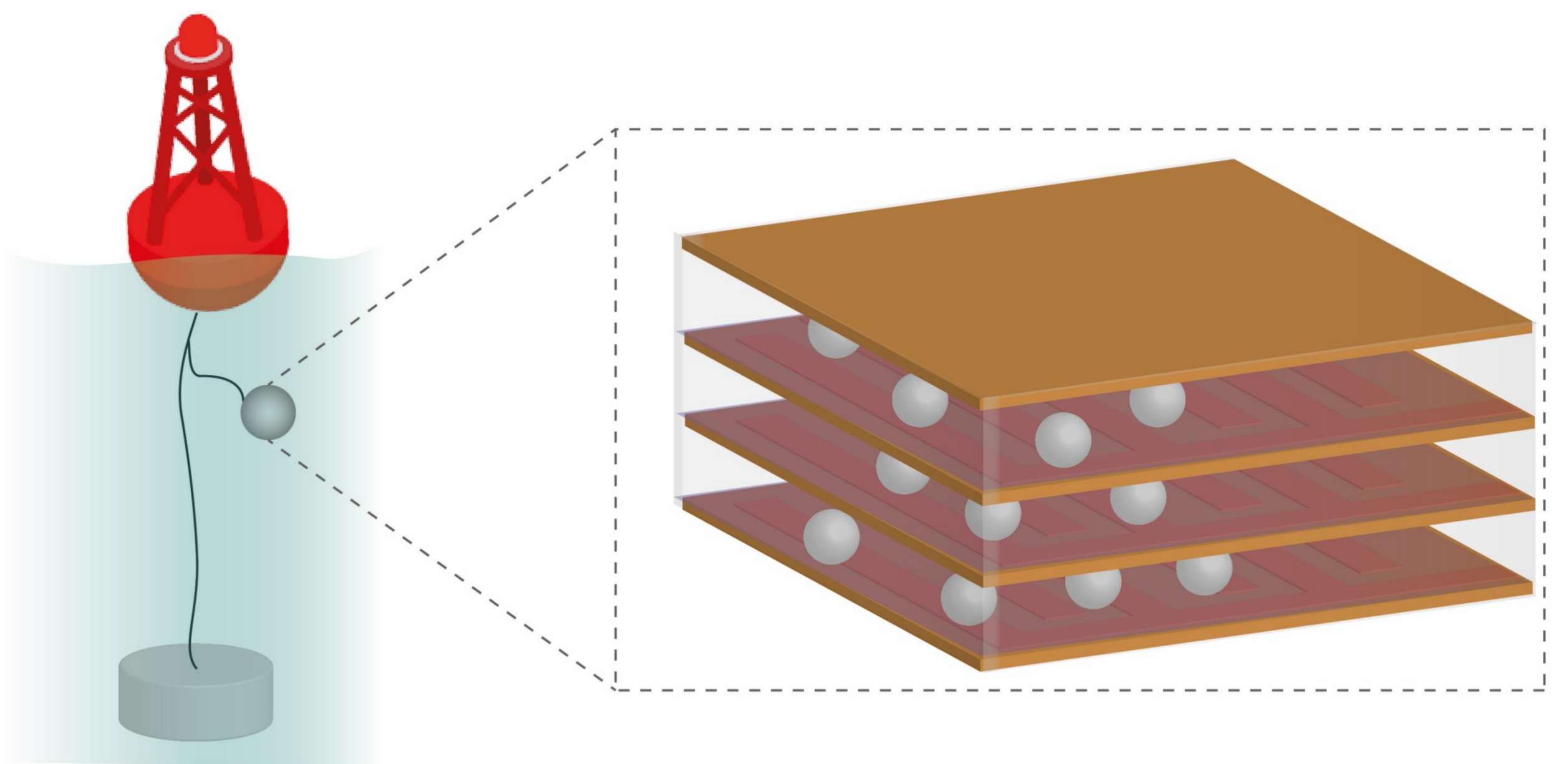


An interdigital electrode based triboelectric nanogenerator for blue energy harvesting

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Introduction

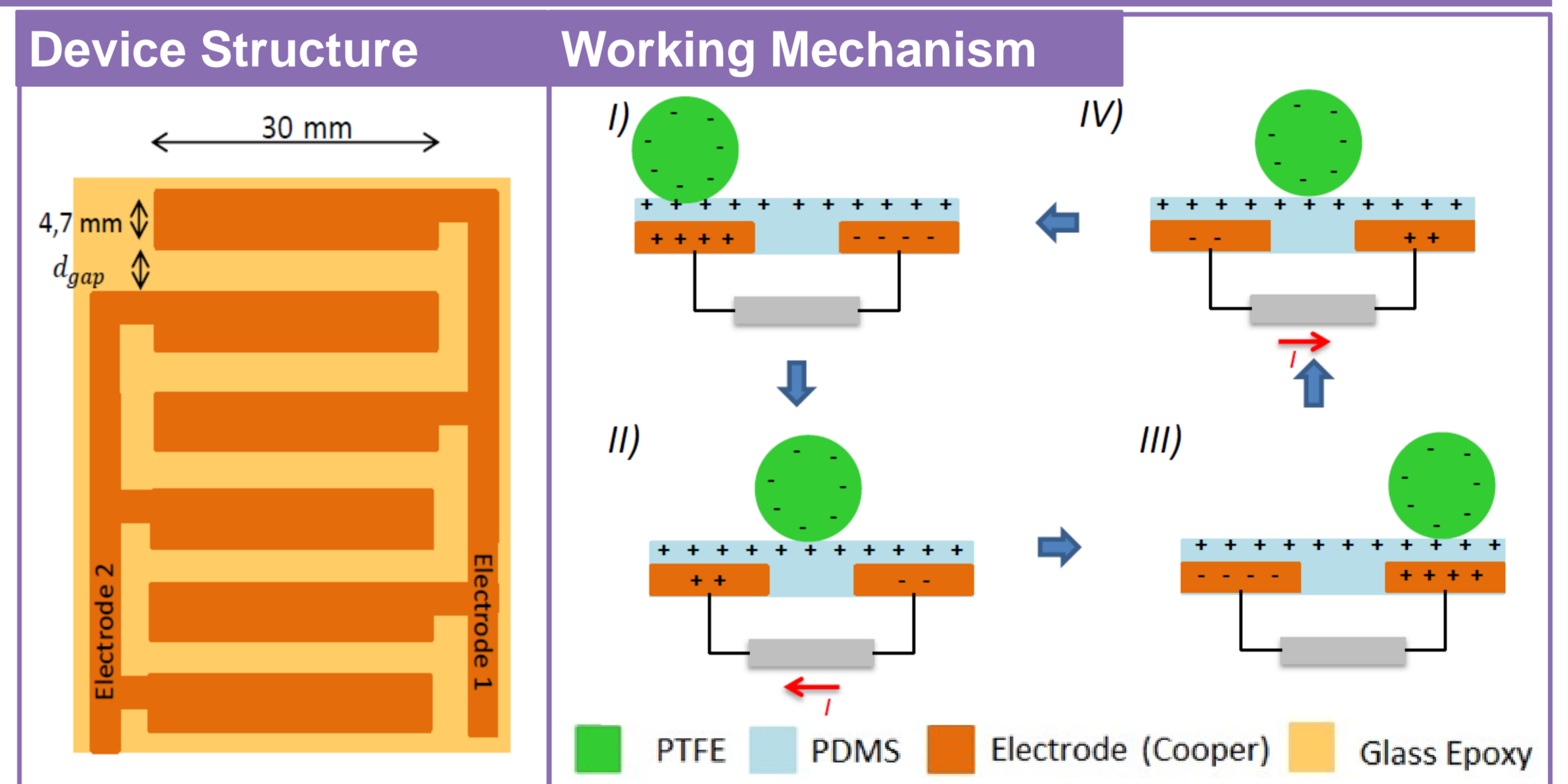
Triboelectric nanogenerators (TEGs) are an emerging mechanical energy harvesting technology that was demonstrated in 2012. Due to their flexibility, they can be fabricated in various configurations and consequently have a large number of applications. Here, a triboelectric nanogenerator was developed and optimized inside a floating buoy to harvest Ocean wave energy. To optimize the TENG, we studied the performance of our device using different number of spheres and units in parallel.



Floating buoy-based TENG

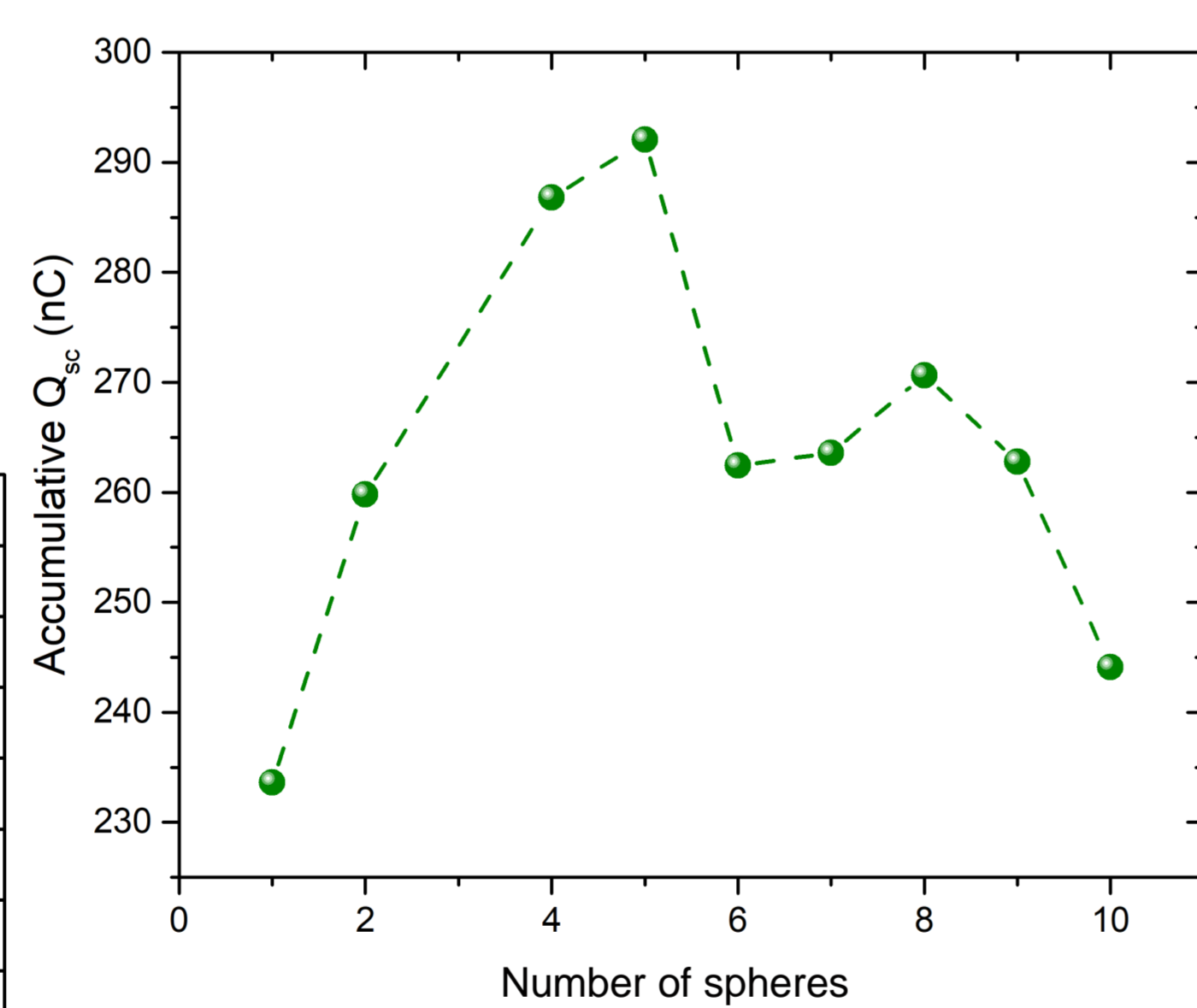
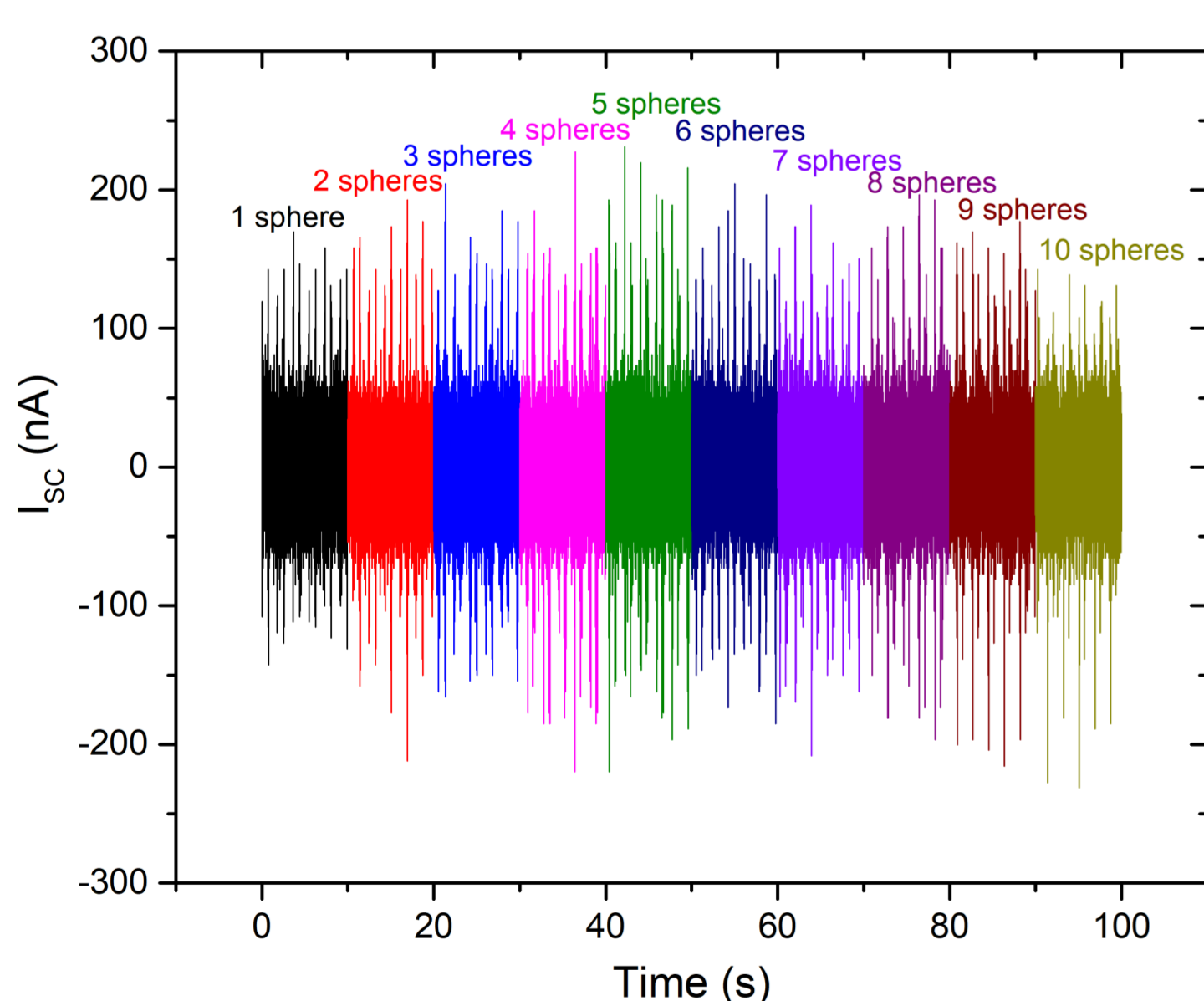
The buoy-based TENG is composed by PTFE balls and a PDMS film as triboelectric materials. It also has 6 copper electrodes and a substrate of glass epoxy.

The working mechanism of our buoy-based TENG is based on the sliding-mode freestanding triboelectric-layer-based nanogenerators.



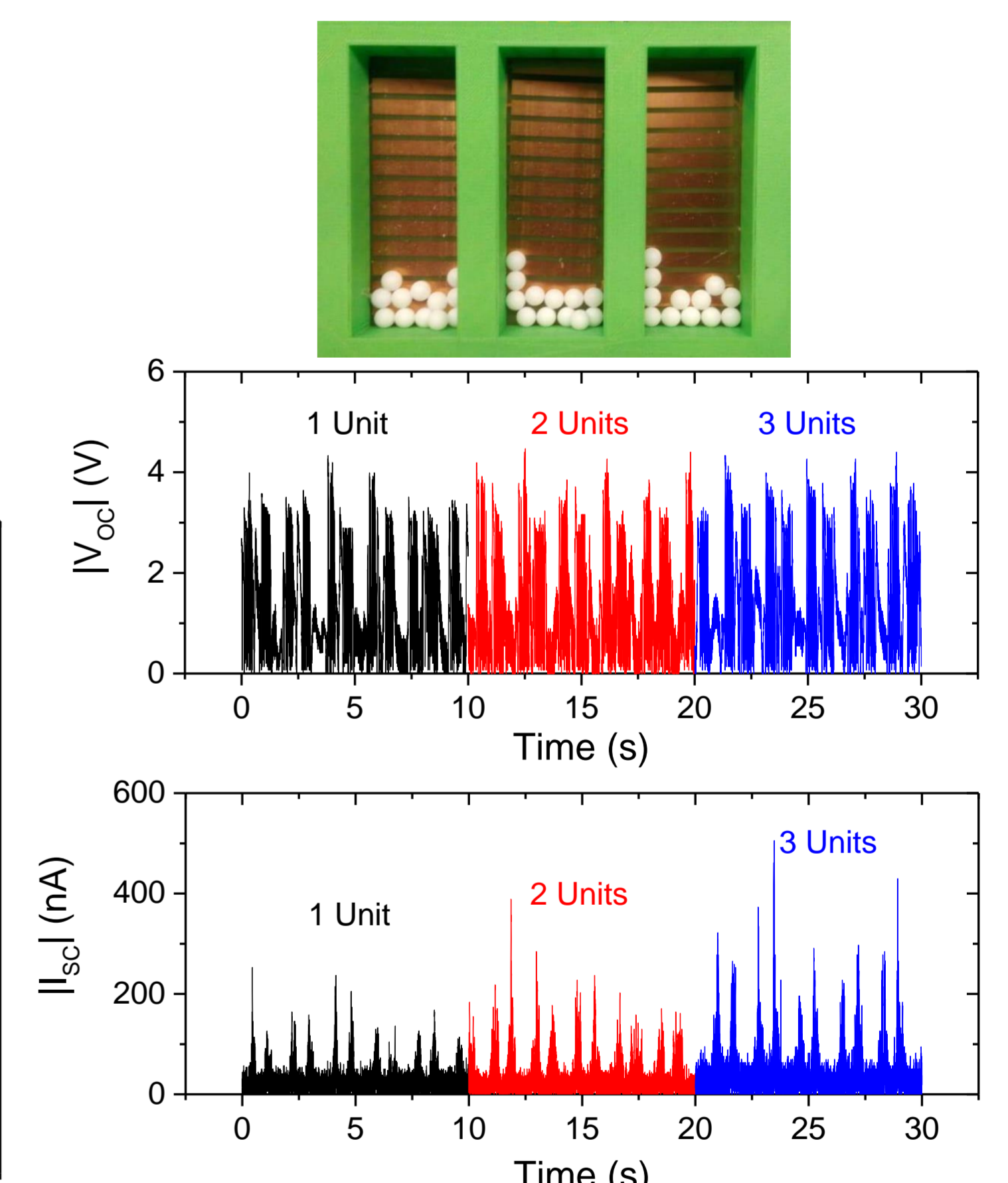
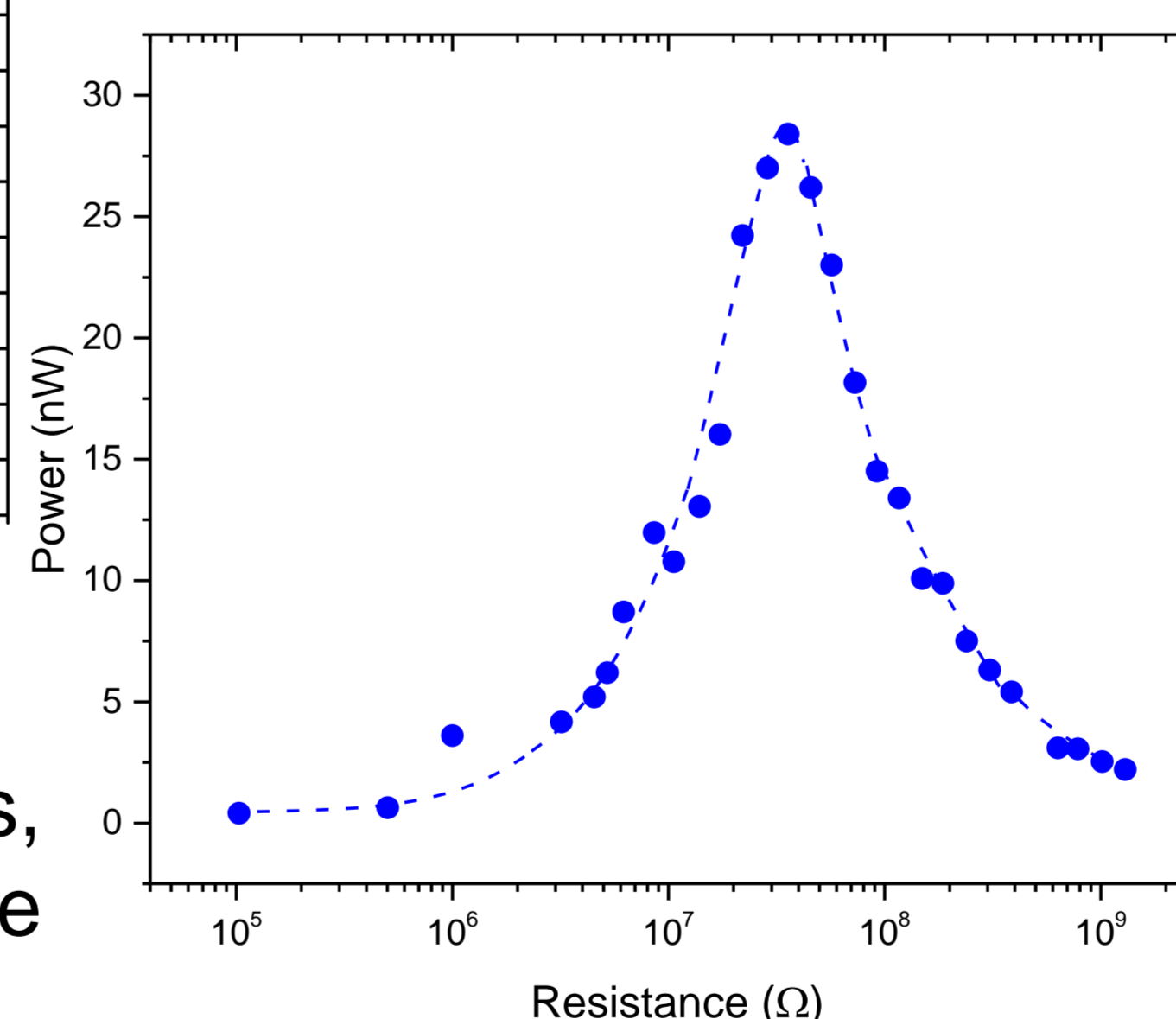
Optimization of Triboelectric Outputs

The TENG's performance slightly changes with different number of spheres (1-10 spheres)



Optimum number of 5 spheres, corresponding an accumulative charge in 10 s of ~ 290 nC.

A maximum output power of ~ 30 nW occurred for a load of 35MΩ.



With the number of units:
$\langle V_{OC} \rangle$ remains constant;
$\langle I_{SC} \rangle$ increases

Conclusions

- Floating buoy-based TENG allows to harvest arbitrary directional water wave energy;
- The electricity generation process of the assembled device results from the freestanding triboelectric mode;
- The buoy-based TENG has the best performance with five PTFE spheres and generates a maximum power of 30 nW;
- With three units connected in parallel a maximum $\langle I_{SC} \rangle$ of 500 nA was achieved.