

Electro-Intrusion: High Efficiency of Mobile Energy Recovery for EVs

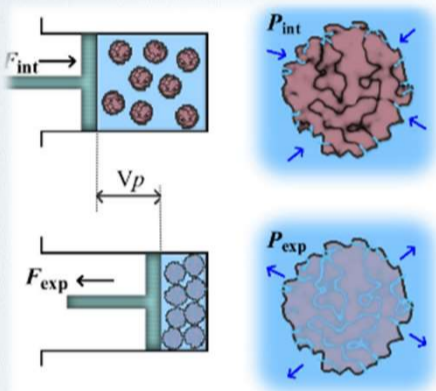


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Aims & Fundamental Basis

This project aims to develop a new method and apparatuses for simultaneous conversion of mechanical work of undesired vibrations and heat extracted from the environment into electricity using zero-emission nanotriboelectrification during non-wetting liquid intrusion-extrusion into-from porous material.

The overall concept of the project is to demonstrate a high efficiency of (mechanical + thermal)-to-electrical energies conversion via nanotriboelectrification during non-wetting liquid intrusion-extrusion process.

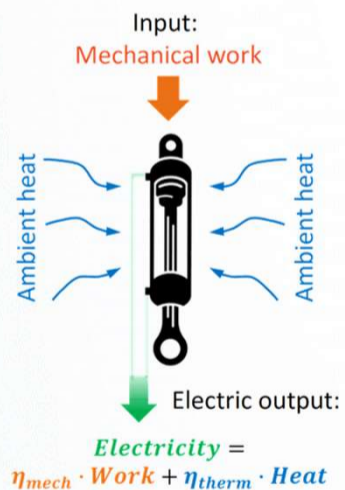


A large fraction of energy is transformed into electrical energy generated via nanotriboelectrification during mutual displacement of a non-wetting liquid and a porous material.

Intrusion-extrusion nanotriboelectrics enabled heat pump exploiting dissipated mechanical work to extract energy from the environment producing electric current.

Project Vision

Imagine the impact of applying this to a large scale over many economic sectors, energy may come from any vehicle, trains, aircraft, ships, pieces of industrial equipment, turbines, engines, common household devices like washing machines, lawn mowers and tools drills and jackhammers.

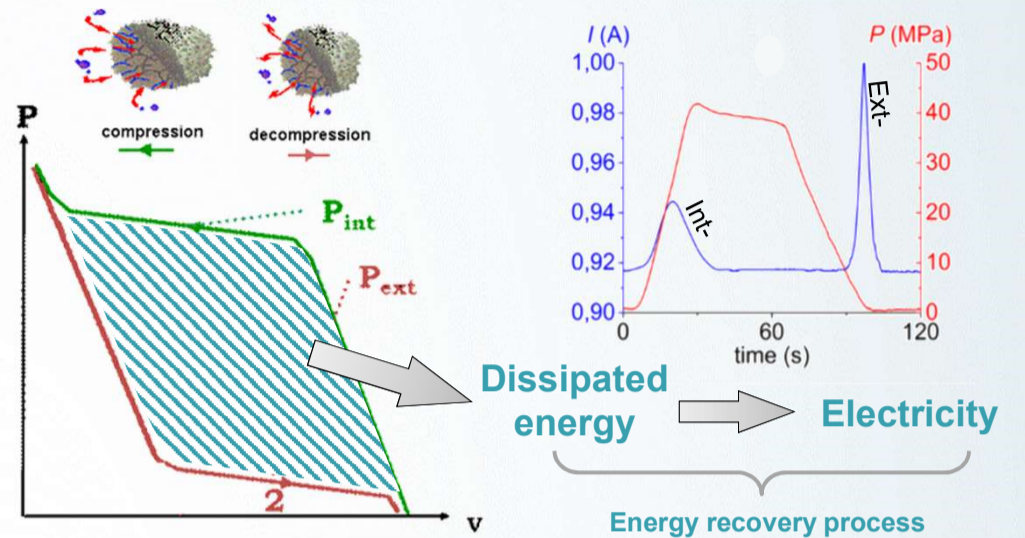


Electro-intrusion project will have a significant impact on society. It will contribute to increasing the energy efficiency of a broad range of commercial apparatuses, reduce the cost of their use, increasing their productivity of their corresponding sectors and contribute to the overall goal of the EU towards a carbon dioxide neutral society.

References

- [1] WZ, TZ, HK, YD*. *Energy*, **2022**, 257, 124697.
[2] YG*, AF, JN, J-PG. *J. Phys. Chem. C*, **2017**, 121, 21, 11499–507.

Experimental Approaches



When water is forced to into a cycle of entering and exiting from a hydrophobic porous material, the nanopore, the liquid, and solid acquire opposite electric charges. These charges can be collected and generate current.

This process takes the heat energy from the environment. This is similar to how heat pumps work, which passively harvests heat when the motor pushes the fluid.

Device Design & Integration

Here, the energy driving the liquids entry or intrusion is the vehicles vibrational energy. The idea is that to harvest the vibrations plus heat from the environment to charge your vehicle batteries and power its system as you drive.



Acknowledgment

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