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# Tailoring the 3D porous structure of conducting PEDOT:PSS cryogels via the ice-templating method

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**ABSTRACT:**

In the research field of high-performance energy conversion devices, porous conducting polymers (PCPs) have attracted much attention these recent years. Low weight and high porosity combined to fine charge transport properties put them at the forefront of promising materials for many innovative applications such as supercapacitors thermoelectrics, solar steam generators or triboelectrics. Even though it was mostly used for thin films in the past decades, Poly(3,4-ethylene dioxy thiophene): poly(styrenesulfonate) (PEDOT:PSS) is one of the best candidates for 3D porous macroscopic materials.

Here, we describe a two-steps method (polymer gelation followed by ice-templating) to elaborate centimeter thick macroporous cryogels of tunable structure.

The gelation mechanism is investigated by SAXS, cryoTEM and spectroscopy characterizations. Cryo-SEM experiment on the hydrogel reveals how the native fibrillar structure turns into a honey-comb like structure (Figure). The ice templating method at different freezing rate allows us to vary the mean pore size of the cryogels from 30 to 350 µm. The effect of the pore size on the electrical and charge transport properties is discussed.

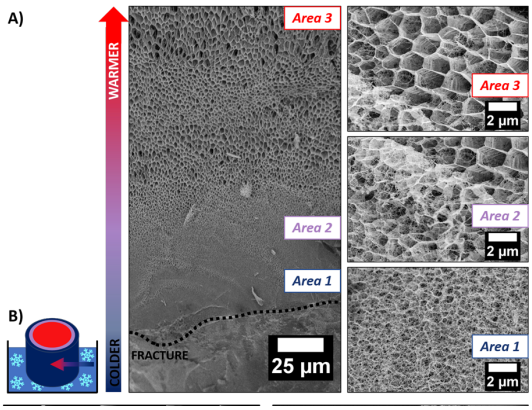


***Figure: cryo-SEM of a unidirectionally frozen piece of PEDOT:PSS hydrogel.***

**KEY WORDS**: porous conducting polymer, polymer gelation, ice-templating, SAXS and cryo-SEM

## References

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2. Weinbach et al, *Front. Electron. Mater.* (2022), 2:875856.