# Nanoporous carbon from egg white biomass for efficient Capacitive Deionization

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Freshwater scarcity due to rapid population growth and industrialization accentuates the issue of sustainable water recovery. Capacitive Deionization (CDI) has emerged as an efficient, energy-saving approach for brackish water desalination[1]. Among several factors that can affect desalination efficiency, the nature of electrode materials plays a pivotal role. Porous carbon derived from biomass has drawn increasing research attention due to the ease of fabrication, low cost, and sustainability of carbon produced from biological precursors[2]. However, challenges remain in processing techniques to achieve high carbon yield and tunable morphology, which requires a clear understanding over the chemical and elemental compositions as well as the structural characteristics of bio-based precursors[3].

In the present study, nanoporous carbon was successfully synthesized by a two-step method involving carbonization and chemical activation using egg white as a raw material, as illustrated in Figure 1. Structure characterization showed a honeycomb morphology with an extensive three-dimensional network of interconnected macropores and mesopores. The final material exhibited high specific surface area (1547 $m^2/g$), high pore volume (2.21 $cm^3/g$) and tight control over mesopore size as revealed by the BET and BJH analysis. Nanocomposite electrodes were then prepared by depositing carbon slurry on graphite substrates in the form of coating. Batch-mode electrosorption experiments were carried out in a lab-scale CDI cell to evaluate the desalination performance of the electrodes. Nanocomposite electrodes showed a significant electrosorption performance with specific capacitance of 480 $mF/cm^2$ (at 2 mV/s), salt adsorption capacity of 7.4 mg/g and current efficiency of 95% at 1.2 V in 300 ppm NaCl solution. The outcome was ascribed to the intrinsic properties including high specific surface area of carbon produced making it highly attractive as electrode material.

**Acknowledgments** The authors appreciate the financial support from the project "CARBONGREEN" (T1EDK-01729) co-financed by the European Union and Greek national funds.

## References

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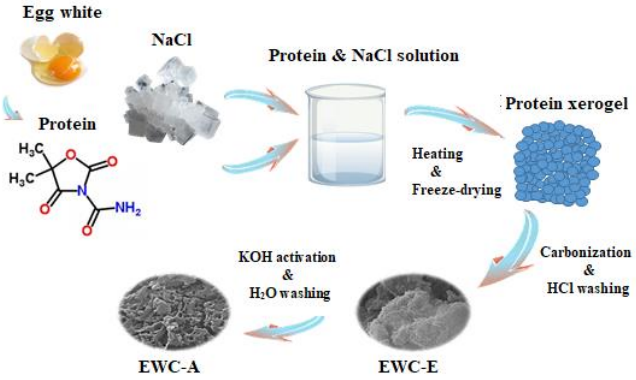


**Figure 1:** Detailed synthesis process of egg white-derived activated carbon, EWC-A