

PEAT AS A CARBON SOURCE FOR BIFUNCTIONAL PLATINUM-FREE OXYGEN ELECTROCATALYSTS

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The polymer-electrolyte membrane fuel cell (PEMFC) industry continues to grow rapidly, with a 200% increase in megawatts shipped over the last five years [1]. As a result, more effort must be put towards identifying and developing possible alternatives to commercial platinum-based catalyst materials to circumvent the issue of platinum scarcity [2]. One promising candidate is a group of catalyst materials based on carbon modified with inexpensive transition metals and nitrogen (M-N/C, where M is Co or Fe). In this case, the source used for producing the carbon is critically important as it can severely impact the physical and electrocatalytic properties of the resulting catalyst.

This work aimed to synthesize carbon from well-decomposed peat, an abundant biomass material with no economic application, via several different methods and then modify the peat-derived carbons into active Co-N/C type oxygen reduction catalysts. Several characterization methods were used to investigate both the physical and electrochemical properties of these materials. Most importantly, it was found that using ZnCl₂ in the peat carbonization procedure yielded the most active oxygen reduction catalyst. A maximum power density of 210 mW cm⁻² was reached with PEMFC single cells assembled using this catalyst as a cathode material.

References

1. E4tech, 2021, *The Fuel Cell Industry Review 2020*.
2. Y. He, S. Liu, C. Priest, Q. Shi, G. Wu, 2020, *Chem. Soc. Rev.* 49, 3484-3524.



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