Novel biomass-derived materials as efficient electrocatalysts for \( O_2 \) reactions

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**Introduction**

The current environmental and energy crisis has stimulated the development of cleaner, sustainable, and efficient renewable energy storage and conversion technologies. Some of these technologies include fuel cells (FCs) and water splitting devices. Though mechanisms may differ, their core relies on electrochemical reactions: oxygen reduction (ORR) and water splitting into \( H_2 \) (HER) and \( O_2 \) (OER), where electrocatalysts play a key role.\[1-3\]. In ORR, conventional electrocatalysts are based on noble metals, such as Pt and Pd. However, these have poor stability under operating conditions, as well as high cost and scarcity, seriously limiting their large-scale commercial applications. As an alternative, biochar-based materials have been explored for ORR in energy storage and conversion devices, due to their low cost, abundance, and availability\[4\].

Herein, we report the preparation and application as ORR electrocatalysts of a new set of doped and functionalized biochar-based materials prepared using vineyard pruning wastes.

**Electrocatalysts preparation**

**Experimental**

**Materials characterization**

**Oxygen reduction reaction (ORR)**

**Conclusion**

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**References**


