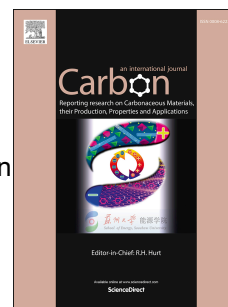


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## Nitrogen and boron co-doped hollow carbon catalyst for the oxygen reduction reaction

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### Abstract

Hollow particles of N,B co-doped carbon were synthesized at different temperatures and used as electrocatalysts for the oxygen reduction reaction (ORR). The particles were synthesized by chlorinating  $\text{Ti}(\text{C}_{0.3}\text{N}_{0.7})$  and  $\text{TiB}_2$  powders, with the sample formed at 800 °C showing the highest ORR activity, which was comparable to a commercial Pt/C catalyst. The catalyst electron transfer number of 3.94 was close to 4, indicating high selectivity for the ORR. The excellent ORR performance arose from the particle structure that facilitated mass transport, including the hollow shape with well-developed micro and macro pores, and various active nitrogen functional groups on the surface. Boron also played an important role along with the nitrogen, improving the activity for the ORR through a synergistic effect. These properties make these materials promising for the ORR and other electrochemical applications.

### 1. Introduction

Low density, good interconnectivity, and exposed

active sites on the surface make hollow carbon particles promising for nanotechnology

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