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# Bottom-up construction of Fe–N–C active centers: Towards sustainable oxygen reduction reaction electrocatalysts

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Noble metals employed in conventional oxygen reduction reaction (ORR) electrocatalysts are scarce and costly. Seeking sustainable alternatives to the use of noble metals through the development of more sustainable carbon-based electrocatalysts has thus been the focus of our research.

Combining our recent findings on the application of carbon nanotubes-supported iron phthalocyanine [1], Fe–N-modified hollow carbon spheres [2], and carbon black [3,4] in the ORR, we have moved towards the design of an effective electrocatalyst where single-atom Fe–N active centers surrounded by Fe nanoclusters, N-containing sites, and the high porosity of carbon black contribute to a high electrocatalytic activity and stability towards the ORR [5]. By optimizing the synthesis conditions, we were able to do so by employing only earth-abundant and inexpensive precursors (Fig. 1). This communication reports our contribution towards the advancement of knowledge on the design of affordable and sustainable non-noble metal-containing carbon black electrocatalysts for the ORR.



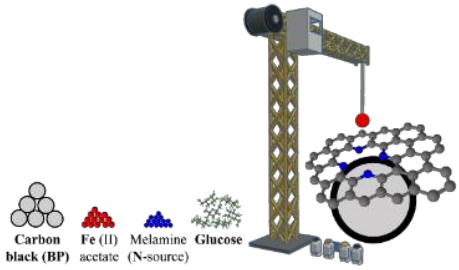


**Fig. 1.** Representation of the bottom-up construction of single-atom Fe–N active centers at the surface of carbon black through our synthesis methodology employing only broadly available precursors.

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