

Porous activated binderless pellets for electrochemical oxygen reduction and evolution reactions

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The oxygen evolution reaction (OER) and the oxygen reduction reaction (ORR) are important electrochemical reactions for sustainable energy devices such as water splitting technology and fuel cells. Traditionally, noble metal catalysts have been considered as the best electrocatalysts due to its high activity. However, the high cost, scarcity, and poor long-term stability of these noble metal-based catalysts significantly hinder their large-scale applications. In this sense, metal-free carbon catalysts have attracted much attention in these energy conversion and storage technologies because of its good electronic conductivity and high activity, in addition to their low-cost and wide availability. Here, we present a simple strategy to produce porous activated carbon materials in the form of pellet derived from the hydrochar prepared via hydrothermal carbonization of glucose solution followed by activation with KOH, CO₂ or their mixture. The advantage of this methodology is that the activated carbon were produced in the form of a self-standing pellet or disc, resulting in the absence of any agglomerate or binder. The activation conditions were tuned in order to study the effect of the textural properties on the electro-catalytic activity and to optimize the resulting activity and stability of the carbon material.