**Conductive polymers and conductive polymers-derived carbons for energy conversion and storage – current status and beyond**

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Electrochemical energy conversion systems are expected to play one of the crucial roles in the green energy transition, aiming to remove strong dependency on fossil fuels. Different electrochemical energy conversion systems (supercapacitors, batteries, and fuel cells) are mutually complementary in terms of energy and power density, but the properties of electrode materials ultimately determine their performance. In this contribution, we shall present and critically discuss some potential applications of conductive polymers, primarily polyaniline (PANI), and corresponding polymer-derived carbons as electrode materials for electrochemical capacitors, as electrocatalysts for O2 reduction, and also as supports for fuel cell catalysts. The application of PANI-based materials is determined by the redox activity of conductive polymers imposing limitations regarding the electrode potential and pH window. On the other hand, PANI-derived carbons are much more robust and can be used in wide potential and pH ranges. Moreover, by tailoring polymeric precursor morphology and chemical composition, the properties of carbon materials can be tuned rather effectively, rendering their capacitive and electrocatalytic properties. Using different synthetic routes, it is possible to tune the gravimetric capacitance of PANI-derived carbons up to 400 F g−1. Moreover, the selectivity of these materials for O2 reduction can be optimized to favor the 2e− or 4e− reduction of oxygen molecules. However, despite the tremendous amount of work so far, the community is still unsure which are the key properties determining materials' performance for a given energy conversion application. While there are indications that specific surface area, pore size distribution, and electrical conductivity are of key importance, other reports indicate that chemical composition is the prevalent factor. However, a complex interplay between different materials' properties is more likely to determine the materials' performance under various operative conditions. To reveal these fine interactions between materials' properties, it might be necessary to apply interdisciplinary approaches and develop advanced data-based algorithms with explanatory and predictive power, allowing us to direct the synthesis toward desired properties surpassing the trial-and-error approach.

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