Reduced graphene oxide as an electrode material for aluminum-chloride batteries

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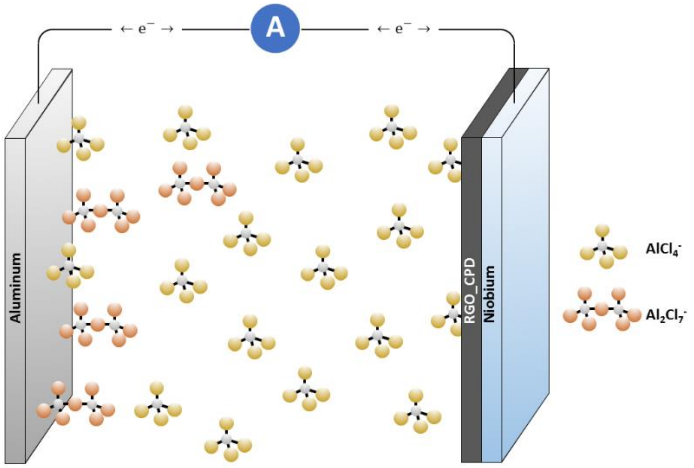
Nanocarbons have been explored in the development of next-generation electrode materials for energy storage systems (EES). Our group has previously described how different oxidation-reduction strategies of reduced graphene oxide (rGO) may influence the electrochemical response of these materials [1]. More recently, we observed that it is also critical to control the final drying step [2].

Among the multivalent battery chemistries, aluminum-based systems have the potential to offer higher energy densities at a lower cost. Aluminum (Al) ions are trivalent and bear a small ionic radii. In EES, this enables remarkably high theoretical gravimetric and volumetric capacities, 2980 mAh/g and 8040 mAh/cm3, respectively. Research in the field of Al batteries has focused heavily on electrodes made of carbonaceous materials. Accordingly, it is believed that the high structural quality and low defect density of graphitic carbons are crucial to obtain superior performance and cycling stability in these batteries. Still, and despite all effort, the capacities reported for these systems remain stubbornly low, particularly when compared to the >300 mAh/g attained by commercial lithium-ion batteries.

We wish to communicate an Al-chloride battery (ACB) where rGO powder, dried under supercritical conditions, is used as the active cathode material. This system attained a gravimetric capacity of 171 mAh/g (one of the highest for ACB)and remarkable stability over a wide range of current densities. These properties are thought to be the consequence of the cathode's tailored porosity [3].



References:

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