Electrochemical Modification of Nanostructured Carbon Materials with N and P functionalities

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Surface chemistry has a key influence in carbon materials performance in applications such as energy production, energy storage, pollutant removal and biomedical applications. Thus, tailoring of the surface chemistry is critical to optimize the materials. In this sense, electrochemical methods are powerful for fine tuning the surface chemistry of carbon materials since they permit to incorporate different kind of functionalities with a high selectivity, reproducibility and scalability. One important aspect for the incorporation of stable and active functionalities in the carbon surface is the proper interaction between the carbon surface and the electroactive species. This work focuses on the electrochemical modification of different nanostructured carbon materials, including carbon nanotubes and graphene-based materials, by oxidation of substituted-aniline (4-aminophenyl phosphonic acid). Depending on the carbon material employed and the applied potential, the degree of N and P surface functionalities incorporation is influenced by the nature of the carbon material. At the same time, the onset potential for electrochemical modification of the carbon materials and electrochemical behavior of the modified materials has a remarkable dependence with the carbon material structure.