

ELECTROCHEMICAL BEHAVIOR OF Pt- AND Pd-SUPPORTED ACTIVATED CARBONS WITH DIFFERENT FUNCTIONALITIES

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Due to their relatively low price, high surface area and versatile physico-chemical properties, conductive carbon materials are considered among the most promising supports of electroactive species and/or catalysts for different electrochemical devices, like supercapacitors, fuel cells, batteries, sensors, etc. [1]. However, in these applications, carbon supports are usually subjected to oxidation and/or corrosion processes, which can be promoted by the supported electroactive species and/or catalysts [2]. In this sense, although the surface functionalities of carbons seem to play a key role on their electrochemical response and stability, their influence in the presence of electroactive catalysts is still controversial. Particularly, the effect of phosphorous groups has been never reported. In this work, the influence of different oxygen and phosphorous functionalities on the electrochemical behavior of Pt- and Pd-supported activated carbons (ACs) has been studied.

Various ACs showing similar surface areas (ca. 1400-1500 m²/g) and a rich variety of surface chemistry, with oxygen and phosphorous-like surface groups, were obtained by physical (CO₂)

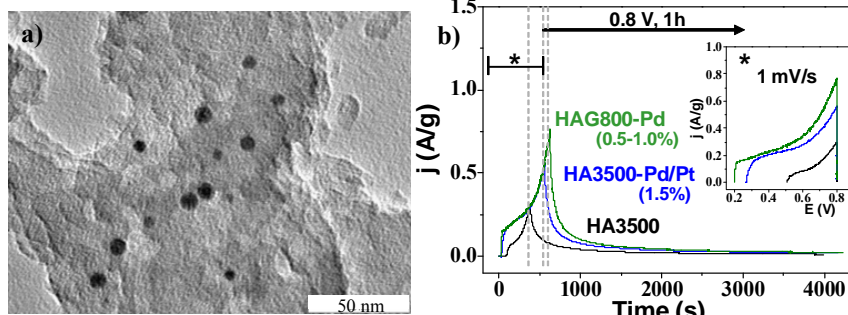


Fig. 1. a) SEM image of HA3500-Pd/Pt sample; (b) Chronoamperograms (1h) of different samples at 0.8 V in 1 M H₂SO₄ solution. Inset: E vs. j profile before reaching 0.8 V at 1 mV/s.

(HAG800 support) or chemical (H₃PO₄) (HA3500 support) activation of olive stone. The ACs were used as support of Pd, Pt and Pd/Pt catalysts (Fig 1a), with nominal loadings of 0.5-1.0 wt%, by using the incipient-wetting impregnation method. The samples were characterized by N₂ and CO₂ adsorption, TEM, XRD, XPS, TPD experiments and different electrochemical techniques.

Although the supported metals promote carbon electrooxidation and/or corrosion (see the higher oxidation currents for the metal-loaded sample – Fig 1b), the presence of surface phosphorous groups (HA3500-M samples) results in lower oxidation currents than in the case of P-free samples (HAG800-M samples) (Fig. 1.b). These results are in agreement with the oxidation resistance induced by phosphorous groups in oxidizing gas phase at high temperatures [3], and may support the statement that these phosphorous groups could enhance the durability of carbon-supported metal electrocatalysts for different electrochemical applications.

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References

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