In this work, the effect of support material surface, namely, defects and crystalline domains, was study and related with platinum nanoparticles size and dispersion. Home-made multi-walled carbon nanotubes surface was systematically modified by two different functionalization and by a partial exfoliation. Raman spectra reveals the increment of surface defects density through the tubular structure after exfoliation, whereas functionalization purified the surface. Additionally, the development of carbonyl and carboxyl functional groups onto the surface was observed after exfoliation treatment by FTIR and XPS measurements.

Platinum particles were deposited by chemical reduction assisted by NaBH₄. Defects and oxygenated functional groups through the exfoliated structure allowed and homogeneous particle size and dispersion of platinum nanoparticles, whereas the purified surface showed the opposite trend. Electrochemical measurements demonstrated that the highest activity towards oxygen reduction reaction (ORR) belongs to platinum deposited onto exfoliated surface.

Interestingly, Electrochemical Impedance Spectroscopy and Koutecky-Levich analysis revealed that the defects and oxygenated functional groups onto exfoliated surface leads to a faster kinetics towards ORR, due to the preferential way is by 4 $e^-$. 

**Keywords:** sp³ carbon nano-domains, platinum nanoparticles, oxygen reduction reaction

**References:**


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