# Effect of the number of electrochemical cycles in polyaniline electrosynthesis on carbon fiber felt semigraphitized

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The beginning of polyaniline electrosynthesis defines morphology, structural and electrochemical properties of polymeric layers. This work aims to study the effect of the number of electrochemical cycles in polyaniline (PANI) electrosynthesis on carbon fiber felts (CFF) annealed at 1600K. The electrosynthesis was carried by oxidative polymerization in aniline 0.5 mol L-1and 1.0 mol L-1 de H2SO4, scanning from -0.50 up to 1.05V vs Ag/AgCl, at 25 mVs-1, using Pt as auxiliary electrode. The characterization of composites PANI@FCC obtained with 3, 6 and 9 voltammetric cycles was realized by scanning electronic microscopy (SEM), electrochemical impedance spectroscopy (EIS), Raman spectroscopy and Cyclic Voltammetry associated to Tafel Plot and Equations of Butler-Volmer to evaluate the behavior of kinetics growing. With 3 cycles, an expressive increasing of layer thickness was observed. With increasing of number of cycles, the growth of PANI on CFF was more intense. The composites obtained with 9 cycles shows overlapped layers of polymer, creating barriers into porous structure. EIS showed that fiber suffer a gradual electroactivity increase with higher cycles, increasing capacitance and decreasing electrical resistivity, this fact can be associated with a decrease of reaction rate constant. It was observed that prime coats of PANI, formed at 3 cycles, followed higher attraction of charges in solution to layer surface, which emphasized between 3rd and 6th cycles. This phenomenon can be related to intense growth of PANI closest to protoemeraldine on the surface of CFF at next 3 cycles, allowing the formation of more crystalline and uniform structure, and indicating requirement of 9 cycles for obtaining more condutive PANI. By Raman spectroscopy,it was noticed that protoemeraldine formation occurred gradatively. Due to changing the surface energy, PANI with less cycles were closest of leucoemeraldine; PANI from 9 cycles were closest to emeraldine and showed more bipolaron.