Electromagnetic shielding behavior using cobalt oxide electrodeposited onto activated carbon fiber felt

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Reflectors and absorbers materials for electromagnetic shielding have attracted great interest of the scientific community due to factors associated industrial norms of compatibility and electromagnetic interference. One of the most used as electromagnetic shielding on frequency range in GHz includes the metals due to its high conductivity. Carbon fiber based composites have been developed as electromagnetic absorption substrate due to their light weight, high strength and low electrical resistivity and many treatments have been used to enhance the absorption property. Based on these considerations, this work proposes to evaluate the effect of the cobalt oxide electrodeposited onto activated carbon fiber (ACF) surfaces on the electromagnetic absorption property of the resulting composites. Firstly, cobalt oxide is a material with remarkable optical, electrical and magnetic properties, second, the used ACF felts present high surface area for deposition and, third, electrodeposition used for synthesis is a low cost and efficient method. The samples were prepared using a solution 0.1 mol L-1 Co(NO3)2 + 0.647 mol L-1 H3BO3 and -0.1 mA cm-2 was applied in different deposition times (10; 50; 100 and 420 s). SEM-FEG microscopy revealed the presence and increase of disperse cobalt oxide nano particles on the ACF surface until 100 s and the deposition of a uniform cobalt oxide film at 420 s. The electromagnetic analysis in frequency range of 8.2 to 12.4 GHz with respect to S parameter showed that wave incidence direction is homogeneous and the permittivity parameter revealed that the dissipative effect (ε'') is dominant with respect to capacitive effect (ε') for all samples and for sample produced at 420 s, the ε'' effect was more pronounced. The more reflectivity level was also revealed by sample produced at 420 s. It is concluded that cobalt oxide/carbon fiber based composites had potential to be used as electromagnetic radiation absorption materials.