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Carbon Black -MoS_2 nanocomposite as novel screen-printed electrodes modifier

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Carbon Black (CB) is a nanostructured material with comparable electrochemical properties to carbon nanotubes and graphene. However, its low cost makes it very appealing in the fabrication of composite materials. Good examples are reported in the literature on the use of CB modified electrodes for electrochemical sensing of antioxidants [1]. On the other hand, Transition Metal Dichalcogenides (TMD) have emerged as electrode material for analytical purposes due to large available surface area and structural versatility [2]. Particularly, MoS_2 as graphene analogue have been widely used in combination with different carbon and metallic nanostructures for sensing and for (bio)sensing in food analysis, biological and environmental samples [3]. The combination of CB and MoS_2 is reported here for the first time. Different amounts of CB and MoS_2 were studied in terms of electrochemical performance, assessed by CV and EIS using redox probe $[Fe(CN)_6]^{3-/4-}$. The best combination (SPE modified with a mix of CB-MoS2 75:25, v/v) showed an enhanced electrocatalysis towards classic electroactive molecules such as dopamine, uric acid, caffeic acid, coumaric acid and different polyphenols, compared to CB and MoS_2 alone. The obtained electrochemical performance is attributed to the synergistic effects between MoS_2 and CB, and it may open new gates for (bio)sensors tuning and design.

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