ELECTROKINETIC SEPARATION OF NON-STEROIDAL ANTIINFLAMATORY DRUGS BY USING GRAPHENE NANOPARTICLES AS PSEUDOSTATIONARY PHASE

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Graphene has attracted much attention since its first discovery in 2004. Several forms of carbon materials such as graphite and, highly ordered mesoporous carbon, carbon nanofiber, carbon nanotubes etc. have been studied to immobilize redox enzymes and used for developing enzyme-based electrochemical devices. Recently, a new form of large surface-to-volume ratio carbon material, graphene, which is a flat monolayer of carbon atoms tightly packed into a two-dimensional (2D) honeycomb lattice, has received a considerable attention. One of the factors makes graphene so attractive is its low energy dynamics of electrons with atomic thickness. It is a semiconductor with zero band gap and high carrier mobility and concentration and shows nearly ballistic transport at room temperature. These unusually electronic properties make graphene one of the most promising candidate materials for future nanoelectronic applications, including graphene-based field effect transistors, gas sensors, nanoelectromechanical switch, supercapacitors, lithium secondary batteries, and so forth. Of particular interest for us is to explore its application in the field of capillary electrokinetic separations. In this way, carbon nanoparticles such as carbon nanotubes (both single walled and multi walled), fullerenes and nanocones has been proposed as pseudostationary phase (PSP) to enhance electrophoretic separation. Normally, they are used as surfactant coated nanoparticles or functionalized as soluble oxidized nanoparticles. In this communication, we explore the use of graphene. As main characteristic, it is possible to use graphene as PSP withouth the need to add additional surfactant to the background electrolyte. Two types of graphenes have been compared. Graphene composed by 1-3 graphene sheets and graphene nanoparticles composed by 4-6 graphene sheets. Both nanosystems have been demonstrated their potential to separate non-steroidal anti-inflammatory drugs derivates of arylpropyl group. However, the highest resolution and low migration time were obtained with individual graphene sheets. It has been observed as migration time increase when increasing the number of graphene sheets in the nanoparticle. Compared with other nanoparticles, graphene allows higher resolution enhancement and they are more soluble and easy to prepare. This results in a high reproducibility of migration times and stability of the background noise.