Evaluation of the performance of single-walled carbon nanohorns in capillary electrophoresis

Juan Manuel Jiménez-Soto, Yolanda Moliner-Martínez, Soledad Cárdenas, Miguel Valcárcel
Department of Analytical Chemistry
University of Córdoba
Marie Curie Building (Annex), Campus de Rabanales, E-14071 Córdoba, Spain
qa1meobj@uco.es

Single-walled nanohorns (SWNHs) are a black nano scale cylindrical tube of graphitic carbon which differs from nanotubes in their "horn-like" shape similar to a bull horn giving them numerous applications. These nanostructures are characterized at the microscopic level to form dahlia-shaped flowers aggregates, or bud, or seed. Dahlia type clusters formed by up to 2000 carbon nanohorns have spherical shapes with diameters ranged from 80 to 100 nm, separated by distances around 0.4 nm, are stable and to separate them into individual units is necessary to functionalize the nanohorns, or surfactants must to be used for dispersal them.

Among its physico-chemical features, is noteworthy to emphasize the high specific surface, reaching values of 50 to 500 m^2/g. In addition, SWNHs have the ability to establish hydrophobic interactions with aromatic compounds through π-π bonds and van der Waal forces. Because of these and other properties such as high yield, high purity and an aggregate microstructure, SWNHs has facilitated the development of potential applications in adsorption and release of small molecules.

This poster describes for the first time the use of single-walled carbon nanohorns as pseudostationary and stationary phases for electrokinetic chromatography and capillary electrochromatography, respectively, taking advantage of their characteristic features, such as conical-end termination, formation of spherical dahlia-flower like superstructure and easy functionalization. The use of SWNHs as pseudostationary phase for EKC required the study of their dispersion in different surfactants as well as their compatibility with the electrophoretic system. The carboxylation and subsequent immobilization of c-SWNHs in fused silica capillary to obtain useful, reproducible and stable stationary phases for CEC has also been investigated, with promising results. The electrophoretic separations have been systematically compared with those obtained with SWNTs. Water soluble vitamins were selected as model analytes in this work.