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# ON-LINE AND IN-LINE SAMPLE PREPARATION COUPLED TO CAPILLARY ELECTROPHORESIS: THE CONTRIBUTION OF NANOTECHNOLOGY

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Capillary electrophoresis (CE) is a highly efficient and flexible analytical separation technique: over time, it has become a serious competitor for gas, liquid and supercritical column chromatographies. A substantial variety of commercially available equipments is by now available for use in routine laboratories. However, robust methodologies should be developed to be transferred as working methods at the bench analytical level in control laboratories. For this purpose, some key aspects should be considered at research and development level. Thus, first, by regarding the CE literature one may check that only a small fraction of reported CE separations consider the difficulties involved in sample preparation. Such an essential step of chemical measurement processes in general, is even more crucial in this separation technique as a result of the need to insert very small sample volumes, the typically low sensitivity of the detection systems, and the strong influence of the sample matrix components.

On- and in-line treatment arrangements to commercially available CE instruments offer a practical approach to integrate sample processing to the proper separation/determination step. On the other hand, last years nanotechnology, especially the use of nanoparticles, has become a good alternative to perform sample treatment.

In this communication, the use of on- and in-line arrangements based on nanoparticles will be discussed. In concrete, several examples involving carbon nanotubes, metal oxides nanoparticles and hybrid nanoparticles will be presented. Such as the use of soluble nanoparticles in the BGE to remove matrix interferences, the use of minicolumns to perform sample preconcentration or the use of hybrid magnetic nanoparticles transiently immobilized with magnets in the capillary. Although there is a large number of nanoparticles that can be used to perform sample treatment, carbon nanotubes have been widely used because their unusual and excellent properties. The especial affinity of carbon nanotubes to interact with aromatic organic compounds allows their use to perform solid phase extraction step with a double objective: i- to preconcentrate the analyte and ii- to remove potential interferents from sample matrix. The ways to combine and use carbon nanotubes with CE will be described and classified according the solubility of the carbon nanoparticles in the background electrolyte. As a main advantage, it must be marked the simplicity of procedures as well as the possibility to renew the nanoparticles in each analysis. This aspect results in the enhancement of analytical properties of the CE method.