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Capillary electrochromatography and its potential in the pharmaceutical industry

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Capillary Electrochromatography, also called CEC, is an emerging chromatographic method in which the liquid mobile phase is driven through the stationary phase in a packed capillary column (50 to 200 μm id) by the electro-osmotic flow (EOF) generated by an electric field applied through the capillary. The technique permits separations of both neutral and charged species with better resolution and higher efficiency compared with high performance liquid chromatography, HPLC, where the mobile phase is pressure driven. Euerby et al (1996). Neutral species are separated by partitioning between the mobile and the stationary phases while the separation of charged analytes is achieved by differential electrophoretic mobilities. The application of EOF allows the use of smaller packing material (<1 μm) and longer capillaries than in HPLC thanks to the absence of back pressure. A major parameter in CEC is the packed capillaries and more especially the reproducibility of packing methods dedicated to CEC. Therefore, four different packing methods were investigated in order to determine which one was the best one in term of column reproducibility. Tong et al (1995) and (1994), Boughtflower et al (1995) and Robson et al (1996). The comparison of the four packing methods investigated has shown similar type of results: reproducible, rapid analysis and high efficiencies providing evidence of good capillary stabilities. The reproducibility within a same capillary is higher that the reproducibility capillary-to-capillary. The day-to-day reproducibility is excellent and a two months study gave a %RSD less than 2%. In the pharmaceutical industry, CEC has to prove to be reproducible and robust enough to be employed on a day-to-day basis with all sorts of pharmaceuticals. A large set of pharmaceutical samples has been analysed by CEC and this method has shown advantages compared to the usual analytical methods. On-going research has also shown how rapid and highly efficient separations of pharmaceutical compounds could be achieved by CEC in analyses which are quantitative, reproducible and robust. Further research might be concentrated in the mechanism of CEC to make its use routine for pharmaceutical analysis.

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