Direct Observation on Electroosmotic Flow Profile and Pressurized Flow Profile of the Fluorinated-Bonded Silica Packed Rectangular Capillary

Chaiyavat Chaiyasut

Department of Pharmaceutical Science, Faculty of Pharmacy, Chiang Mai University, Chiang Mai 50200, Thailand

E-mail: chaiyavat@pharmacy.cmu.ac.th

ABSTRACT

Electroosmotic flow (EOF) profiles and pressurized flow profiles in fluorinated-bonded silica packed rectangular capillary were investigated. A microscope CCD-video system was used to observe the flow profiles of 0.03 mM Rhodamine-6G in cyclohexanol, containing 0.1mM sodium dodecyl sulfate. The 2.3 cm homemade slurry-packed column was used. The fluorescence property of Rhodamine-6G in the solution after excitation with white light made it possible to directly observe the profiles through the microscope CCD-video system. The rectangular capillary was transparent and caused less distortion of images, enabling clearer images to be observed. Pressurized flow was generated by lifting one end of the capillary. The fluorescent samples moved towards the other end of the capillary. The images were captured, recorded and analysed. The pressurized flow profiles were parabolic. The parabolic shapes were different in skewness and peakedness along different sections of the capillary. High voltage 3 kV was applied to the capillary. EOF was then generated and moved towards the cathode. Flow velocities were then calculated from the moving distance of fluorescent samples against time. It was found that EOF velocities were not different along the capillary, indicating the homogeneity of surface charges along the column. The mean of average EOF velocity and its percent relative standard deviation (%RSD) were 2.22 ?m/sec and 0.68 respectively. The EOF profiles were flat, compared to the previous controversial EOF profiles in open tubular column. It might be due to the negative charges, occurring on this stationary phase during the application of the electric field as discovered in previous reports. This provided more evidence to indicate the benefits of using fluorinated-bonded silica packed column. EOF profile of this phase was much flatter than pressurized flow profile. It implied higher efficiency of separation, using Capillary Electrochromatography (CEC) rather than using High Pressure Liquid Capillary Chromatography (HPLCC).

Key words: Electroosmotic flow, Pressurized flow, Fluorinated-bonded silica, Capillary electrochromatography, Capillary chromatography, Rectangular capillary

INTRODUCTION

Capillary chromatography is one of the main tools for separating mixtures and it is widely accepted as the most recent advance in separation techniques. There are two ways to drive a liquid through a column (open and packed column), either by application of a