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低拡散カーブを用いたオンチップ液体クロマトグラフィーの開発

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Objective　Particle packed column is commonly used in liquid chromatography (LC) for determination of biological compounds. However, because of the irregularity of the mobile zone, even the best packed column has the limitation of separation efficiency. Recently, pillar array column in which each pillar has exact position in the column has been developed for overcoming this disadvantage. Although lower theoretical plate height could be obtained, the theoretical plate number was still not high because the column length was too short. To fabricate a longer column on a small chip, folding a separation channel is necessary. The objective of the study is to achieve higher separation efficiency with a pillar array column with a turn.

Methods　The microchip with a pillar array column and a sample injection channel were fabricated by multistep ultraviolet photolithography and deep reactive ion etching using the Bosch process. Dimethyloctadecylchlorosilane is applied for the modification of the surface of the separation channel for reversed-phase separation.

Results and Discussion　Low-dispersion turn was investigated to fold the long column on a chip. In order to investigate the separation efficiency, Coumarin 525 and 545 were eluted under reversed phase condition. The separation could be completed within 15 sec. For Coumarin 545, the theoretical plate height was 8.7 μm, which was similar with the value obtained by the straight pillar array column, while the theoretical plate number reached to 1450, which was 2 times of the straight pillar array column. The results demonstrated that the pillar array column with a turn can achieve the same separation efficiency with the straight column. In conclusion, the low-dispersion turn was applied to fold the long column to achieve a better separation on the chip and it should be useful for the determination of complex compounds in biological samples.