Optimal pillar configurations for on-chip chromatographic beds and flow distributors

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Fast developments in the field of life sciences in the last decade are posing the world of chromatography for new and more complex problems to solve. To overcome these increasingly high demands, chromatographers are turning more and more towards miniaturisation and on-chip applications. In the last couple of years, microfabricated chromatographic columns in which the traditional particle beds have been replaced by etched micropillars have shown much potential. In this dissertation, a number of design issues concerning the design of the pillar bed, the important side-wall region and on-chip flow distributors are addressed. Through both Computational Fluid Dynamics simulations and accompanying experimental studies, designs for the pillar bed geometries are optimised. Finally some design rules are proposed for the further development of this promising new type of chromatographic columns.