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Preparation and Evaluation of Mesoporous Silica Layers on Radially Elongated Pillars

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Highlights

- Uniform mesoporous silica layers were prepared on radially elongated pillars.
- Mesoporous silica layers dramatically increased the retention capacity.
- High column efficiency of REP columns was maintained even with the silica layers.
- Superior kinetic performance in separations requiring high N numbers was shown.

Abstract

The present paper describes the application of a sol-gel procedure on radially elongated pillars (REPs) using tetramethoxysilane and methyltrimethoxysilane. After octadecylsilylation, the quality of the porous layered REP (PLREP) columns was evaluated by in-situ determination of migration velocities and band broadening of coumarin dyes with fluorescence microscopy in reversed-phase liquid chromatography. Based on the increase in retention due to the sol-gel process, an increase in accessible specific surface by a factor of 112 was observed. Argon physisorption measurements on bulk monoliths prepared with the same method revealed a predominant pore size of 91 Å. Plate heights as low as 0.4–0.8 μm ($k = 0–1.97$) could be obtained thanks to the very low dispersion of the REP format and to the fact that the applied silica layer was conformally and uniformly deposited on the flow-through channels. A kinetic plot analysis demonstrated

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