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# Axial heterogeneities in capillary ultrahigh pressure liquid chromatography columns: Chromatographic and bed morphological characterization

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## Highlights

- Systematic axial heterogeneities depicted for 75  $\mu\text{m}$  i.d. capillary UHPLC columns.
- Kinetic performance study complemented by bed morphological analysis.
- Highest separation efficiency and bed homogeneity observed towards column outlet.
- Enhanced band broadening contributions from wall effects towards column inlet.
- Constant-pressure mode causes axial gradients in packing rate and bed morphology.

## Abstract

We study axial heterogeneities in capillary ultrahigh pressure liquid chromatography (UHPLC) columns through kinetic performance and bed morphological analysis. Two columns are used in this work, a 75  $\mu\text{m}$  i.d.  $\times$  100 cm column packed with 1.3  $\mu\text{m}$  C18-silica particles and a 75  $\mu\text{m}$  i.d.  $\times$  45 cm column packed with 1.9  $\mu\text{m}$  C18-silica particles. The long column is chromatographically

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