Application of the isopycnic kinetic plot method for elucidating the potential of sub-2
micron and core/shell particles in SFC

Sander Delahaye\textsuperscript{a}, Ken Broeckhoven\textsuperscript{b}, Gert Desmet\textsuperscript{b}, Frédéric Lynen\textsuperscript{a}

\textsuperscript{a} Separation Science Group, Department of Organic Chemistry, Universiteit Gent, Krijgslaan 281 S4-bis, 9000 Gent, Belgium

\textsuperscript{b} Department for Chemical Engineering, Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussel, Belgium

One of the many advantages that Supercritical fluid chromatography (SFC) is attributed with
over high performance liquid chromatography (HPLC) is that it should be possible to use
longer columns and/or columns packed with smaller particles at higher velocities. This is due
to the higher diffusivity of analytes in supercritical fluids compared to liquids (higher optimum mobile phase velocity) and to the lower viscosity of the mobile phases in SFC
compared to HPLC (resulting in lower pressure drops over the column). In this work the
isopycnic method to construct kinetic plots for SFC was used to investigate the performance
limits of an SFC system when using sub-2 \( \mu \text{m} \) fully porous particles and sub-3 \( \mu \text{m} \)
superficially porous particles. This isopycnic kinetic plot method for SFC was developed and
tested earlier for SFC separations on bare silica with pure CO\textsubscript{2} as mobile phase. In this work, C18 columns were used in combination with more realistic modifier amounts in the mobile
phase in order to show the possibilities of measuring the performance of an SFC system as a
function of flow rate for realistic chromatographic experimental conditions. Kinetic plot
predictions were made for separations on 1 \( \mu \text{m} \) and 0.5 \( \mu \text{m} \) particles in order to examine the
possibilities of working with these very small particles on the used SFC and HPLC systems.