EVALUATION OF ENHANCED FLUIDITY LIQUID CHROMATOGRAPHY WITH SUPERCRITICAL CARBON DIOXIDE AS GREENER AND FASTER ALTERNATIVES TO CONVENTIONAL REVERSED PHASE HPLC APPROACHES

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Enhanced fluidity liquid chromatography (EFLC) is a variant of HPLC which allows reduce analysis time reduction and to obtain improved column efficiencies by effectively increasing the permeability of the system and by the ensuing faster diffusion kinetics. The phenomenon can very effectively be obtained by mixing the HPLC mobile phase, prior to injection with a stream of supercritical (green) CO_2, on a conventional HPLC system. However, as much uncertainty remained about the applicability range CO_2 based EFLC in reversed phase LC, allegedly hindered by miscibility limitations, this study was aimed at investigating these effects for various HPLC mobile phases, when applying methanol, ethanol, acetonitrile and acetone as RPLC modifiers together with the addition of various amount of supercritical CO_2 to establish de-mixing limits and therefore workable EFLC conditions. The work was performed under isocratic conditions on conventional 250 x 4.6 mm, 5 µm C18 column. Representative RPLC test mixtures were analysed and UV detection was thereby employed in order be able to investigate in relevant aspects such as peak broadening, detector noise levels, retention factor shifts, selectivity changes etc. It appeared that in the aqueous reversed phase mode up to 15-40 % supercritical CO_2 could be added, while the miscibility further much increasing under non-aqueous RPLC conditions. This technique offers promising prospects in further developments of greener and more efficient HPLC approaches.

Key words: green chromatography, enhanced fluidity liquid chromatography, SFC CO_2, acetonitrile, methanol, ethanol, water