Analytical Chemistry and Sustainable Practices: Use of Sub/Supercritical Carbon Dioxide for Separations

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ABSTRACT

In the future, the rising costs of solvents and stricter environmental conditions will force us to look for greener solvents due to their low toxicity, low environmental impact, low volatile organic compounds (VOCs), sustainability and biodegradability. The use of green solvent is beneficial in many ways like they are better for worker's health because they reduce chemical exposure, eco-friendly and inhibit the greenhouse gas emission. The most abundant solvents for chromatographic purposes on Earth are carbon dioxide and water. Ethanol also comes from natural resources especially from sugar cane and corn starch. Usually, the source of CO_2 is obtained in many ways such as industrial combustion extract. Although CO_2 is considered a "greenhouse gas," but the extracted amount returned to atmosphere is "clean". High-speed sub/supercritical fluid chromatography are a very promising mode of separation. Supercritical CO_2 is mainly created by subjecting the gas to high pressures. Researchers in Pakistan and industries should also consider using sub/supercritical fluid chromatography for their work. In the current research we studied the polarity of CO_2 + MeOH mixtures by a phenomenon using solvatochromism. Certain dyes, like Nile Red, change their color in response to different solvent polarity. Solvatochromism of pressurized CO_2 can be studied in high pressure UV flow cells.