

NOVEL DIELS-ALDER CHEMISTRY IN SUPERCRITICAL CARBON DIOXIDE

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ABSTRACT

Since Diels and Alder found that furan gives 1:1 adducts with maleic anhydride, the [4+2] cycloadditions of substituted furan compounds have been investigated extensively in conventional organic solvents. Supercritical carbon dioxide has been shown to be an effective medium for a range of chemical transformations that have included cycloaddition reactions, acylation reactions, and metal mediated reductions.

These studies investigated a number of Diels alder reactions involving reactive dienes and dienophiles that give stable cycloadducts. The inherent aromatic nature of furans and the instability of the cycloproducts formed at elevated temperatures and pressures contribute far more challenging elements to this type of study. To our knowledge, there have been no reports of Diels-Alder cycloadditions of furan and its derivatives in supercritical fluids. This work investigates the kinetics of furfuryl alcohol with maleic anhydride in near and super critical CO₂ and how varying degrees of pressure (80- 500 bar) and temperature (25-45 °C) effect the rate and product yield of this reaction.

The highly oxygenated 7-oxanoborene compounds formed in the reaction can be further exploited in the synthesis of a number of important chemical and biological compounds. This work provides a significant and important insight into to the potential of CO₂ in synthesis, through the exploration of an alternative approach to the synthesis of compounds previously obtainable through complex organic synthetic routes.