Optimization of microwave-assisted Michael addition reaction catalyzed by L-proline in ionic liquid medium using response surface methodology

ABSTRACT

Michael addition reactions of aldehyde to ß-nitrostyrene catalyzed by L-proline were investigated by using controlled, monomode microwave-assisted technique in a closed vessel system. Ionic liquid 1-butyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide ([bmim]NTf2) was used as the reaction medium to replace the commonly used volatile organic solvents and as a good absorbing solvent during Michael reaction under the influence of microwave irradiation. The Michael product is clean and generates good yields in short reaction times with moderate results on enantioselectivity (ee). In this work, optimization of proline-catalyzed Michael reaction was carried out using response surface methodology (RSM) based on a three-factor-three-level central composite design (CCD). Various reaction parameters including catalyst loading (5ï 30 mol%), reaction time (5ï 40 min), and substrate (2ï 5 equivalent ratio) were investigated. A high Michael yield (96.5%) with 36.9 ee% was obtained at the optimum conditions of 10.0 mol% catalyst loading, 5.0 min reaction time, and 2.0 substrate equivalent ratio.

Keyword: Central composite design; L-proline; Michael reaction; Microwave-assisted; Response surface methodology