Abstract

One of the novel approaches towards clean and green technology is the application of microwave irradiation, which is relatively a very convenient, safe and rapid methodology. The aim of the present work was to study the effect of microwave irradiation vis-à-vis conventional heating on lipase catalyzed reactions of commercial importance including kinetics and mechanism. Among many natural and synthetic materials, organic esters have interesting attributes as pharmaceuticals, drugs, perfumes, flavors, plasticizers, solvents, etc. Three types of studies were planned for enzyme catalysis in non-aqueous media for esterification and trans-esterification reactions as follows:

Type I - Immobilized lipases as catalysts under conventional heating
1. Synthesis of butyl-4-methyl-3-oxopentanoate via transesterification in non-aqueous media

Type II - Synergism between immobilized lipase catalysis and microwave irradiation
1. Synergism of microwave irradiation and immobilized lipase catalysis in synthesis of 4,8-dimethylnon-7-en-1-yl (2E)-3-phenylpro-2-enolate in non-aqueous media
2. Microwave assisted enzymatic kinetic resolution of (RS) (±)-ketorolac in non-aqueous media
3. Synergism of microwave irradiation and immobilized lipase catalysis in synthesis of alkyl benzoate esters in non-aqueous media
4. Synergism of microwave irradiation and immobilized lipase catalysis in synthesis of 4-chloro-2-methylphenoxy acetic acid (MCPA) ester in non-aqueous media

Type III - Statistical approaches to optimize process parameters
1. Response surface modeling (RSM) for synthesis of butyl-4-methyl-3-oxopentanoate in non-aqueous media under conventional heating
2. Optimization of geraniol cinnamate synthesis using Taguchi orthogonal array design under microwave irradiation and enzyme catalysis

Keywords: Enzyme Kinetics, Immobilized Lipases, Lipase catalysis, Chiral drug resolution, Microwave irradiation, Response surface modelling (RSM), Taguchi orthogonal array design.