Introduction

Organocatalyst has emerged as one of the powerful tools for asymmetric organic reactions[12]. Among the various type of reported organocatalyst, 1,1′-bi-2-naphthol (BINOL) and its derivatives are among the attractive and powerful catalysts for wide range of the asymmetric organic reactions[1, 2], such as hydrocyanations[3], aldol[4], Mannich[5], Friedel-Crafts[6], Diels-Alder reactions[7] and etc. Numerous BINOL derivatives are expensive; where in most cases they are not commercially available. The desirable BINOL derivatives are only made available by going through a tedious multi-step reaction processes, thereby to recover these precious organocatalysts. Efforts to make heterogeneous BINOL organocatalyst were revealed by immobilising BINOL onto different heterogeneous material, such as polysilane[8], polyethylene glycol[9], micelle-derived polymer[10], polysaccharide-based chiral stationary phase[11], aminated silica[12], mesoporous silica[13] and microporous silica[14].

To the date, magnetic iron oxide particle (MIOP) have emerged as a new supporting material in the purpose of catalyst recovery[15]. The success of MIOPs as solid support to immobilize transition metals, organic ligands, organocatalysts, and biocatalysts were exemplified through absorption or formation of covalent bond[16]. The MIOP-modified catalyst can be easily separated from the solubilised reactants and products mixture by applying an external magnetic field, followed by decantation for further purification workup. MIOP was selected as solid support in this study due to its easy-separation ability from reaction mixture and the facile surface modification[17]. Although there are reports concerning the immobilisation of organocatalyst onto MIOP[18], the BINOL immobilisation onto MIOP has not been reported.

Objectives

1. To develop a general method to immobilise a BINOL-derived catalyst onto MIOP for the preparation of recyclable BINOL catalyst (BINOL-MIOP)
2. To characterise the BINOL-MIOP
3. To evaluate the performance of the BINOL-MIOP via asymmetric aldol reactions
4. To assess of the reusability of the BINOL-MIOP

Synthesis of BINOL-MIOP

Catalytic Evaluation of BINOL-MIOP

1. Aldol reaction between benzaldehydes and pentanone/pentene
2. BINOL-MIOP reusability experiment for aldol reaction between 4-nitrobenzaldehydes and pentene

Characterisation of BINOL-MIOP

References:

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