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MIMETIC PEPTIDES BASED ON PROMISCUOUS ENZYME AS ASYMMETRIC CATALYST IN ALDOL AND MICHAEL REACTIONS

Saadi Bayat^{1, 2} and Basyaruddin A Rahman¹

¹Universiti Putra Malaysia, Malaysia

²Tofigh Daru, Pharmaceutical Company, Iran

Biocatalysis has emerged as an elegant and green tool for modern organic synthesis due to its high efficiency, good selectivity and environmental acceptability. Although, an enzyme is capable of catalyzing a specific reaction effectively, some unexpected experimental results have indicated that many enzymes are catalytically promiscuous. Mimetic peptides based on enzyme as a kind of important chiral scaffold are broadly identified for their obvious advantages, diverse structures and readily accessibility. Based on promiscuous aldo-keto-reductase enzymes, several mimetic peptides were designed which were synthesized and tested as multifunctional organocatalysts in direct asymmetric aldol and Michael reactions. The asymmetric aldol and Michael reactions, as the most prominent carbon-carbon bond formation reactions, are the central study issues in the field of asymmetric synthesis. In this study, promiscuous aldo-ketoreductase (AKR) is used to catalyze aldol reaction between aromatic aldehydes and ketones. Good yield (up to 75%), moderate enantioselectivity (60%), and high diastereoselectivity (dr) up to 93/7(anti/syn) were obtained. Several mimetic peptides from AKR's active site were designed and synthesized as asymmetric catalysts in the aldol and Michael reactions. The corresponding aldol products were produced with high yields (up to 97%) and excellent diastereoselectivities (up to 99/1) and enantioselectivities (up to 99.9) under mild reaction conditions. These peptides exhibit excellent catalytic activity in terms of yield, diastereoselectivity and enantioselectivity. The secondary structures of peptide catalysts provide an understanding of their mechanism.

Biography

Saadi Bayat received his BSc in Applied Chemistry at Buali Sina University (Hamedan, Iran, 2000). He did his MSc in Organic Chemistry at Kharazmi University (Tehran, Iran, 2008). Later he enrolled for the PhD programme at Department of Chemistry, Faculty of Science of University of Putra Malaysia (UPM), under the supervision of Prof. Dr. Mohd Basyaruddin Abdul Rahman. The following year, he was offered scholarship from Graduate Research Assistance (GRA), UPM. Moreover, his research program focuses on mimetic peptide as asymmetric catalysis. He was as a Postdoctoral Research Fellow for a year (May 2014-June, 2015) in UPM. He had been selected to receive Endeavor or Scholarship from the Australian government and joined Dr. Bellinda Abbott's group in La Trobe University, Melbourne (July 2015-January 2016). He has published almost 20 papers and has been serving as an Editorial Board Member in journals of repute.

saadibayat@yahoo.com