

MUKAIYAMA ALDOL REACTION - EXAMINATION OF THE STEREOSELECTIVITY OF 2-TRIMETHYLSILYLOXYFURAN WITH CHIRAL ALDEHYDES IN AQUEOUS MEDIA

The Mukaiyama aldol reaction is one of the most powerful carbon-carbon bond-forming reaction in organic synthesis. This process occurs between silyl enol ethers and carbonyl compounds to afford β -hydroxy ketones and esters which are important building blocks for bioactive molecules and natural products. Unfortunately in most cases this reaction must be carried out in organic solvent and mostly in strictly anhydrous conditions due to instability of many catalysts and intermediates in the presence of even a small amount of water. Therefore the research and synthesis of water-compatible catalysts that catalyse the asymmetric aldol reaction in aqueous conditions is one of the major challenges of modern organic chemistry.

Based on our previous discovery that water has an important influence on the regioselectivity of the vinylogous Mukaiyama aldol reaction of 2-trimethylsilyloxyfuran with aliphatic and aromatic aldehydes (*Chem. Commun.* **2012**, 48, 11029-11031) we would like to demonstrate that the analogous reaction of optically pure aldehydes extends the methodology in diastereoselective way and may be a useful tool for the synthesis of natural products.

The main goal of this research project is to confirm the hypothesis that stereoselective Mukaiyama aldol reaction of 2-trimethylsilyloxyfuran with various optically pure aldehydes in aqueous conditions leads to α -substituted alcohols in asymmetric way. The model reaction between 2-trimethylsilyloxyfuran and (*R*)-glyceraldehyde acetonide catalyzed by Lewis acid in aqueous solution will be used for hypothesis verification. Therefore this studies will confirm that the addition of water to the reaction leads to a switch in regioselectivity of the aldol Mukaiyama reaction also in diastereoselective manner. The next phase of this project will focus on the reactions of other silyl enol ethers based on tiophen and pyrrole structures with various chiral aldehydes.

In nature, many biologically active compounds are based on the structure of 2(*5H*)-furanone substituted at α -position. Unfortunately, the procedure, for the preparation of natural compounds with relevant biological properties, described in literature, usually requires multi-step synthesis characterized by low yield. Mukaiyama aldol reaction as an alternative method conducted under aqueous media enables efficient substitution of cyclic 2(*5H*)-furanon in α -position. Using this methodology the number of synthesis steps can be reduced in simple way increasing the yield of the whole process. Moreover, conducting the reaction in the presence of water is an important aim of the modern asymmetric synthesis because it allows to eliminate harmful organic solvents in favor of more environmentally-friendly conditions.