KUDO LAB.

[Peptide Catalysts]

– New Class of Enzyme-mimicking Catalysts –

Department of Materials and Environmental Science

http://www.iis.u-tokyo.ac.jp/~kkudo/

Molecular Functional Materials Synthesis

Department of Chemistry and Biotechnology

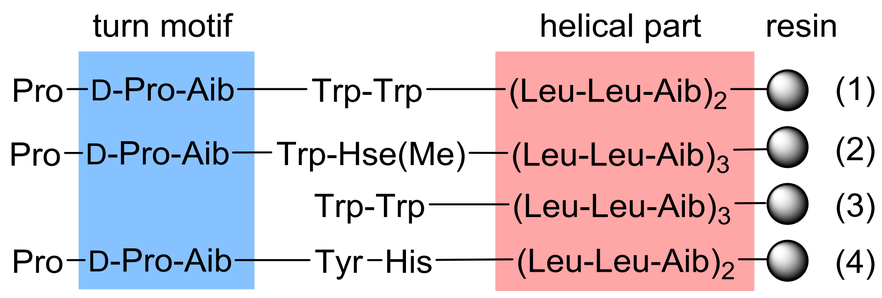
Peptide Catalysts

New class of catalysts inspired by structure and function of enzymes

Enzymes efficiently catalyze various reactions under physiological conditions in a highly selective manner. However, enzymes catalyze only the reactions to make biogenic compounds, hence are not directly applicable to industrial production. Catalysts with strength of enzymes but can promote kinds of reactions are highly desirable.
We have been working on the development of peptide catalysts because the peptides consist of amino acids, just as enzymes do. It was found that several peptides with characteristic secondary structures are good catalysts.
This research can potentially provide a new synthetic process which might shorten the synthetic route of fine chemicals such as drugs, thus it is expected to contribute to waste reduction and energy saving in chemical industry. The peptide catalysts are also scientifically interesting as a new approach in the catalyst development.

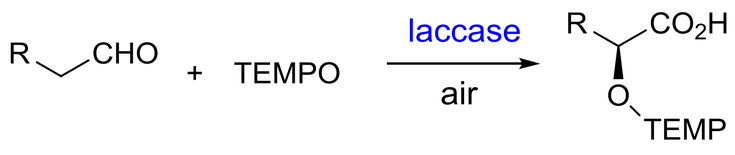
- ◆ Reactions proceed in aqueous solvents at around room temperature
- ◆ Catalysts could be easily recovered from the reaction mixture and reused
- ◆ Two-step reactions proceed in the presence of other catalysts in one pot
- ◆ Library screening method is applicable for development of new catalysts

Amino acid sequence of peptide catalysts

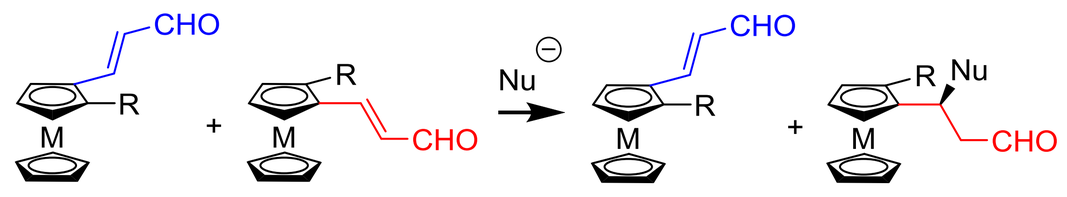


Aib: 2-aminoisobutyric acid
Hse(Me): homoserine methyl ether

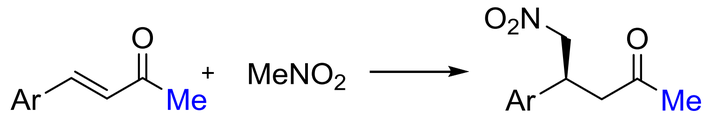
Pepitde/Enzyme cocatalysis [catalyst (1)]



Chiral discrimination of planar chiral compounds [catalyst (2)]



Reaction of ketone substrates [catalyst (3)]



Development of new catalyst by library screening [catalyst (4)]