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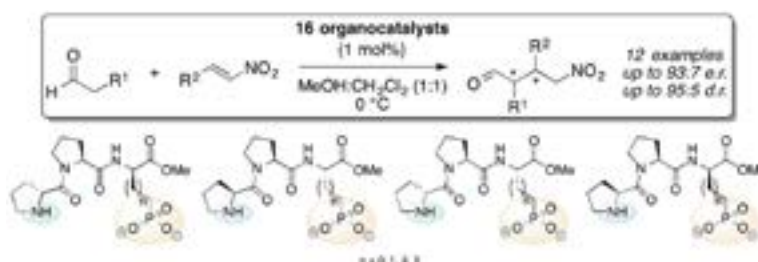
Organic Chemistry

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Easily recyclable phosphonopeptides as organocatalysts for stereoselective C-C bond creation

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By miming enzymes through H-bonding, hydrophobic effects and in-solvent organization, peptides are great candidates for asymmetric synthesis purpose, acting as multiactivating molecules. Combinatorial screening methods allowed the identification of efficient peptide catalysts for C-X and C-C bonds creation. In 2007, Wennemers introduced the tripeptide H-R-Pro-Pro-Glu-NH₂ for Michael addition with great selectivities. Herein we propose an unprecedented combination of aminocatalysis and phosphonic acid activation on a peptide structure. A library of 16 organocatalysts, holding a phosphonic acid was synthesized with a particular emphasis on amino acids modification to install the phosphonic acid on a side chain. These peptides were applied to Michael addition between aldehydes with nitroalkenes with up to 95:5 d.r. and 93:7 e.r. at only 1 mol% loading. These catalysts were easily recovered thanks to their aqueous solubility and reused over 10 cycles without any significant loss of selectivity. The impact of the phosphonic acid in place of a carboxylic acid was investigated, as opposite selectivities were observed. Mechanistic investigations were conducted through structural modifications, kinetic studies and modelisation to understand, and, in the future, optimize this library.



Phosphonopeptides library for asymmetric Michael addition reaction

Biography

Margery Cortes-Clerget has completed her PhD in 2015 from the Université Paris 13 (France) under the supervision of Prof. Marc Lecouvey. She is currently doing her Post-doctoral researches in the field of Green Chemistry at the University of California at Santa Barbara under the supervision of Prof. Bruce Lipshutz.

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