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Title: Asymmetric, Organocatalytic Halofluorination of Alkenes

About one third of all new active pharmaceutical ingredients (API) in drug applications contain one or more fluorine substituents. Furthermore, the three-dimensional structure (i.e. stereochemistry) of those APIs is becoming significantly more complex. This means also that more powerful synthetic methods are required for the efficient and environmentally benign synthesis of fluorine-containing organic molecules. One of the most common method for the synthesis of halogenated organic molecules is the electrophilic addition of halogens to the carbon-carbon-double bonds in alkenes. This is a very old reaction, which has been often utilised in synthesis, however, reagent-controlled stereoselective methods are only available for a few cases. In the framework of this project, it is planned to develop new enantioselective (organo-) catalytic methods for the halofluorination of alkenes. Preference will be given to the synthesis and application of novel organocatalysts based on modified cinchona alkaloids, however, other approaches will also be pursued (for an example, see *Angew. Chem. Int. Ed*. **2019**, *58*, 9239). These new catalysts will enable catalyst-controlled “enantioselective” halofluorinations of alkenes, meaning the catalyst will enable the synthesis of only one 3D-structure of a complex, “chiral” molecule over the its mirror image. The products of these reaction will carry the desired fluorine atom next to another halogen, which can be converted by a substitution reaction to any desired functionality. Finally, the application of the newly developed methods to the synthesis of pharmaceutical relevant compounds will be carried out.

Supervisor: ulrich.hennecke@vub.be

Research Group: https://orgc.research.vub.be/home

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