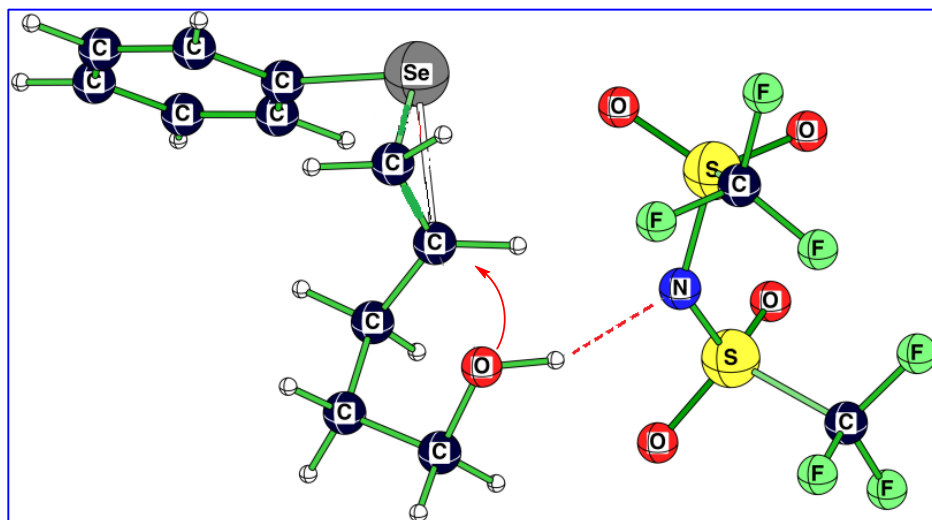




Design and synthesis of ionic liquids for specific applications



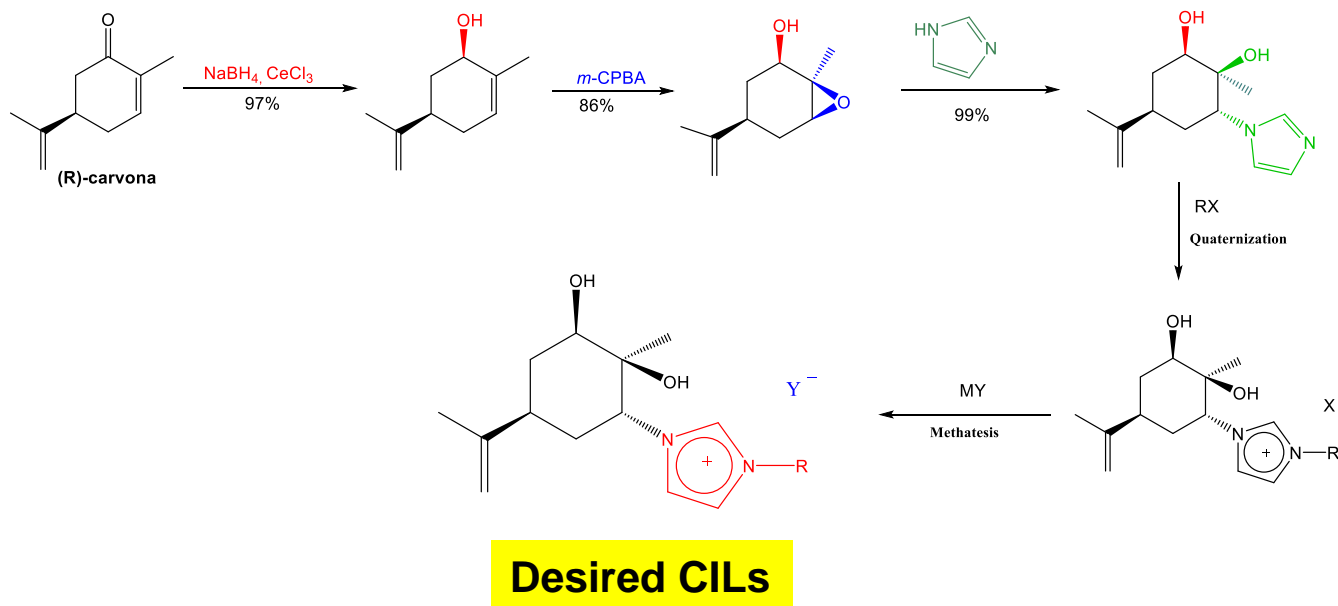
Emilia Tojo
Dept. of Organic Chemistry
University of Vigo
(SPAIN)



1.- Simple Ionic Liquids: obtained in 1 or 2 steps.

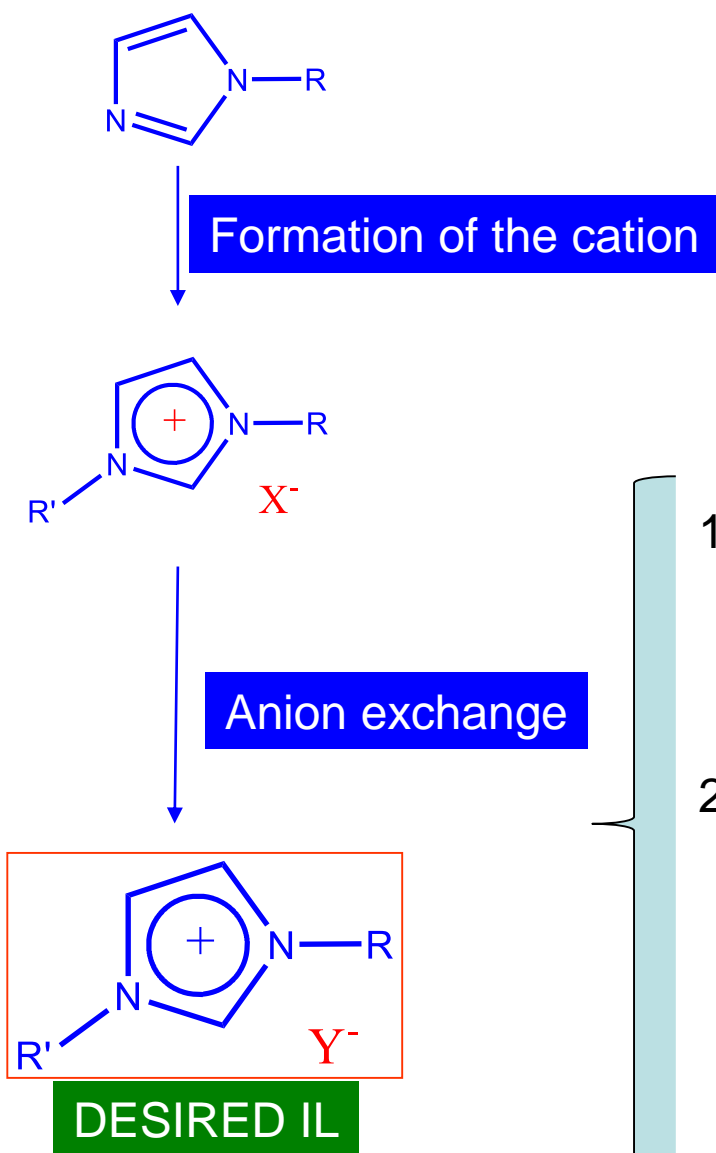
2.- Functionalized Ionic Liquids:

- ❖ Functional groups are attached to the cation, the anion, or both.
- ❖ The incorporation of this functionality provides an special capacity for an specific application.
- ❖ Complex functionalized ILs usually involve a **multi-step process of organic synthesis**.

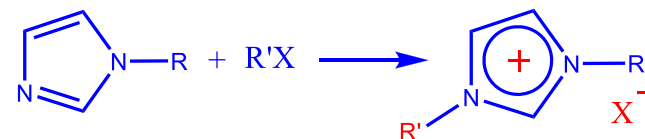




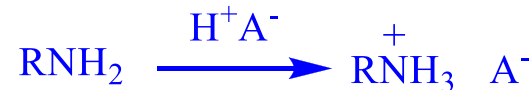
Typical basic ionic liquids synthetic routes



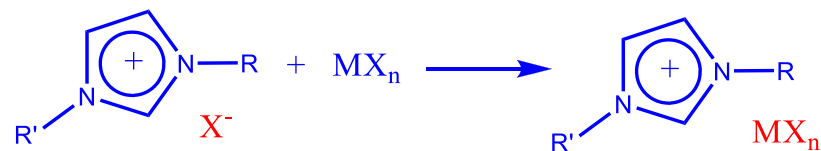
1.- Quaternization:



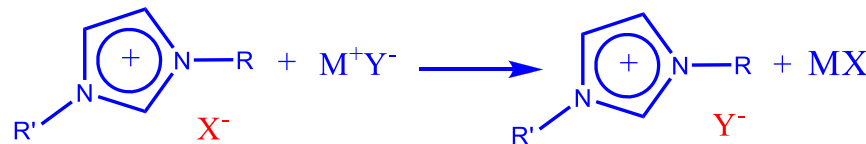
2.- Protonation:



1.- Lewis acid method:



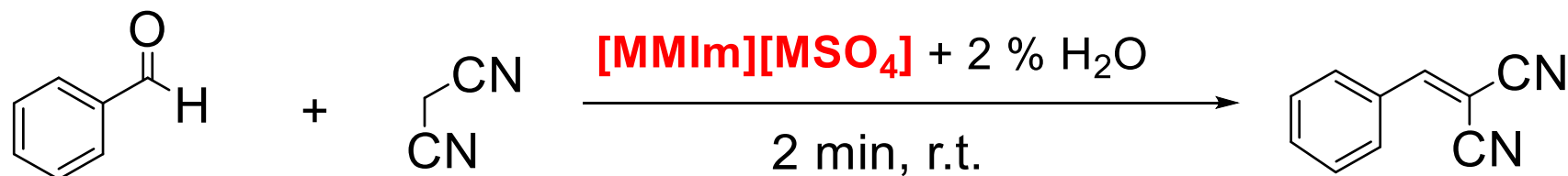
2.- Metathesis reaction:



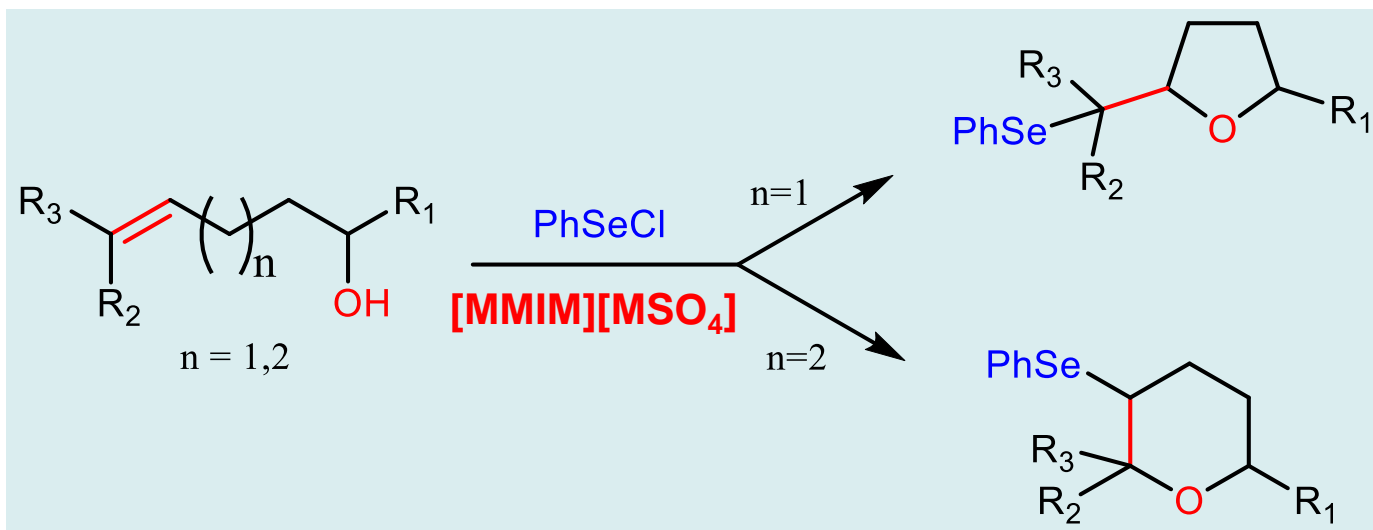
3.- Ion-exchange chromatography



ILs in Organic Synthesis: Knoevenagel Condensation



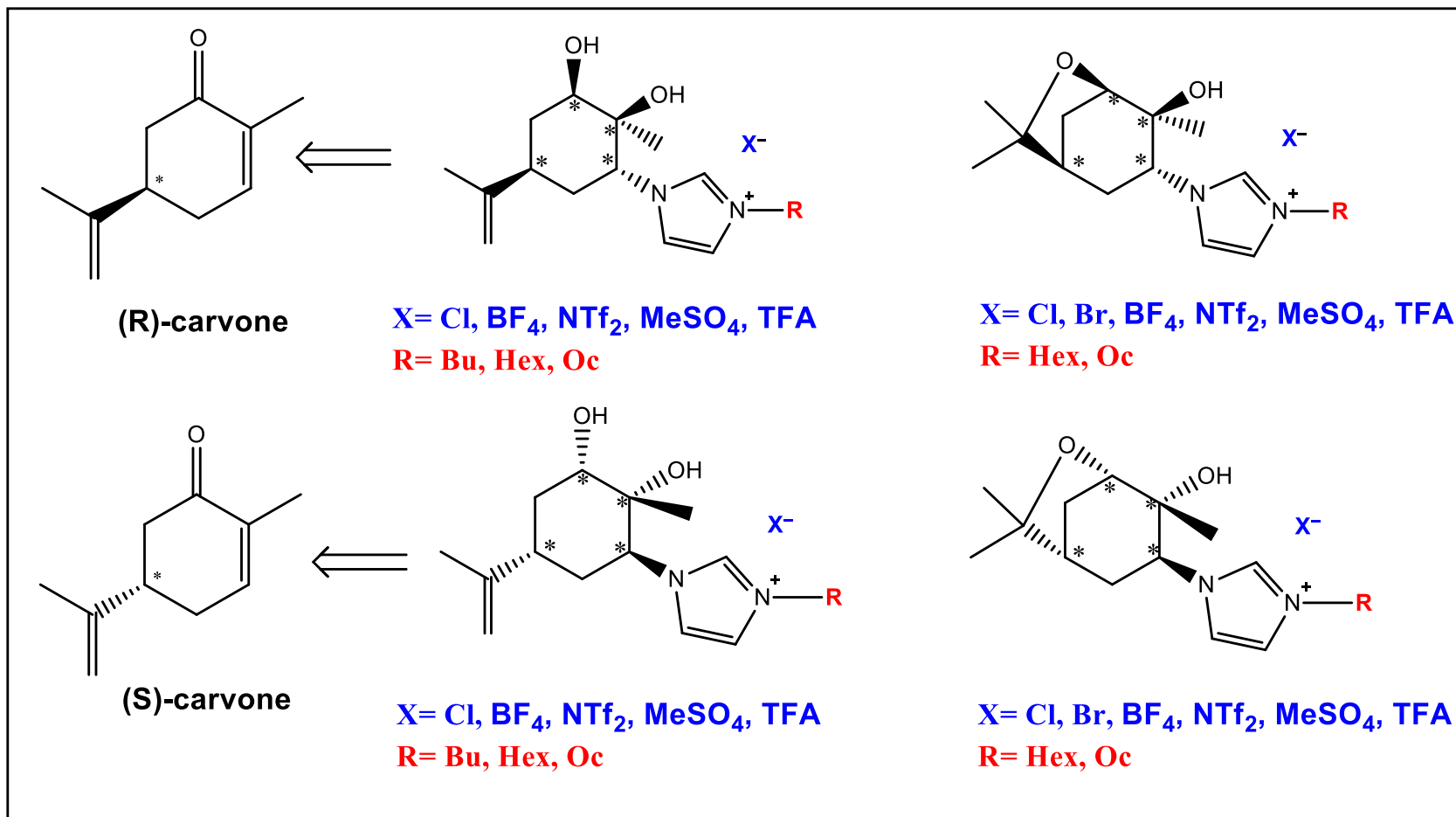
- F. Santamaría; P. Verdía; E. Tojo *Catalysis Communications* 9, 1779 (2008)
- P. Verdía, F. Santamarta, Emilia Tojo *Molecules* 16, 4379 (2011).



- M. Kostiv, P. Verdía, V. Fernández-Stefanuto, R. Putcha, E. Tojo *J. Phys. Org. Chem.* (2018). In press.

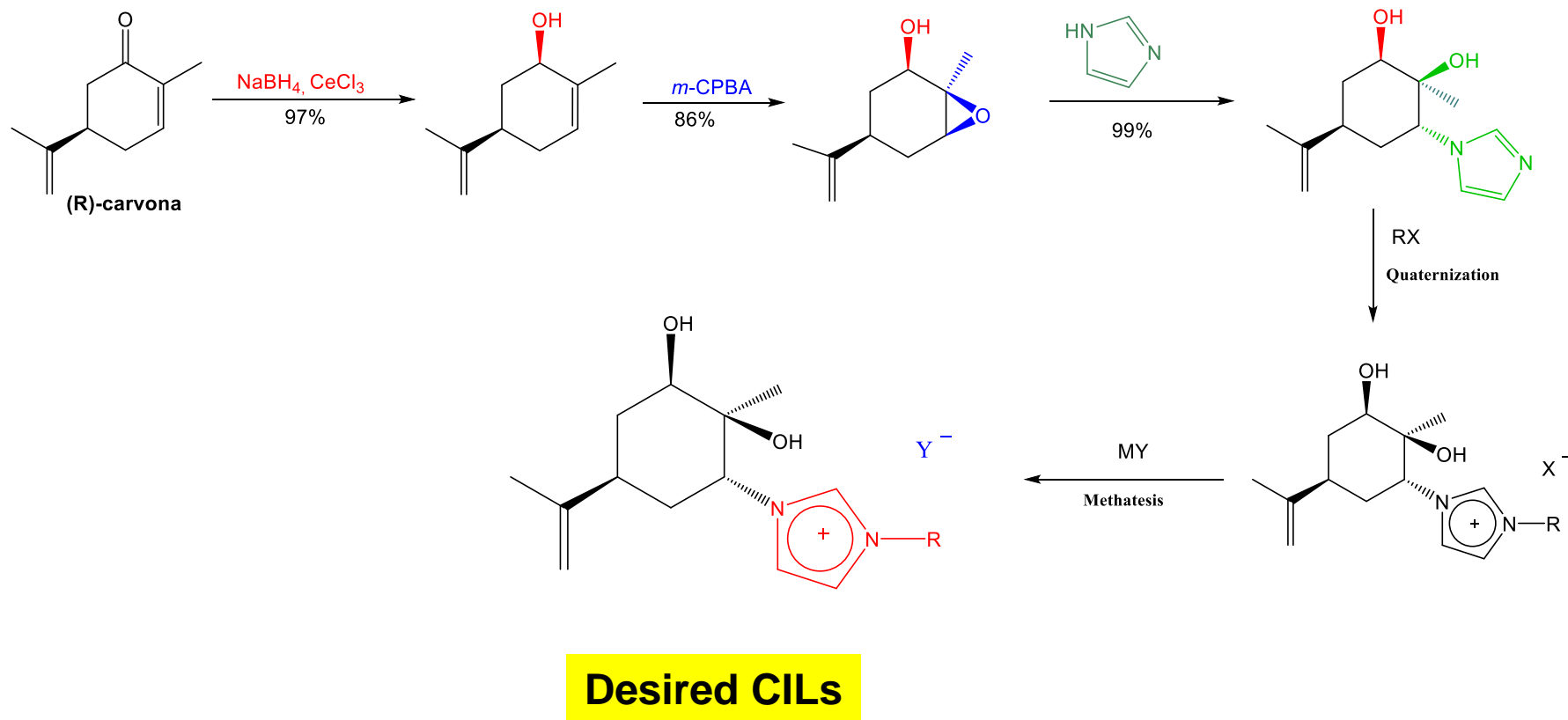


ILs for Chiral Recognition



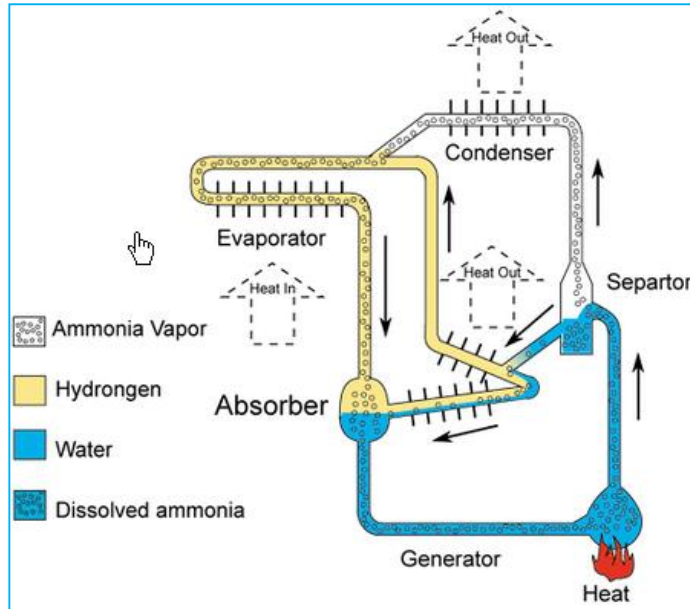


Synthesis of chiral ILs



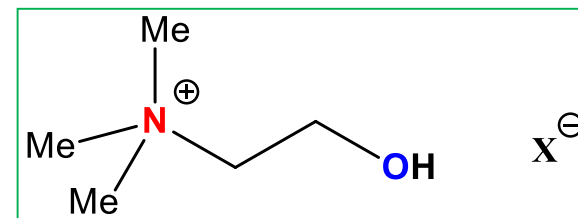
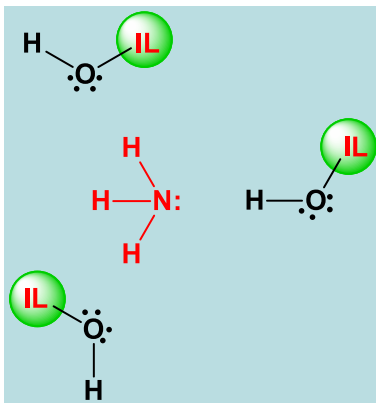


Fluids for NH₃ absorption refrigeration systems



Desired IL:

- ❖ Low toxicity
- ❖ High biodegradability
- ❖ High thermal stability
- ❖ High ammonia solubility
- ❖ Low viscosity



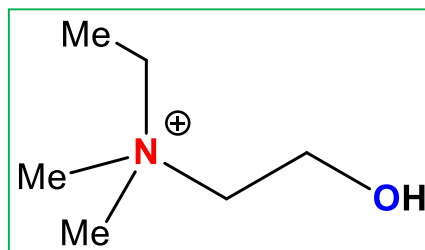
Choline

A water soluble essential nutrient

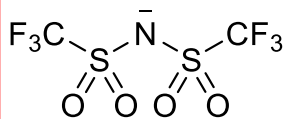


Selected cations and anions

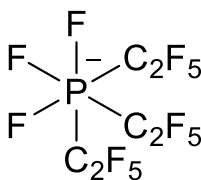
CATION



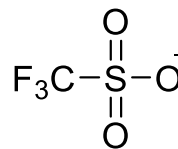
ANIONS



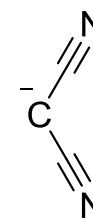
[NTf₂]



[FAP]



[TfO]



[DCA]

High thermal stability
Low viscosity

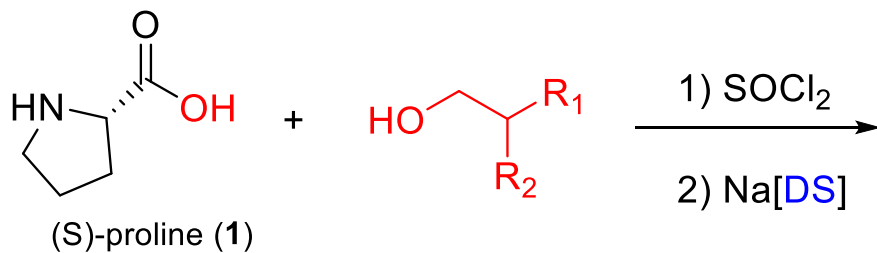
High thermal
stability

High thermal
stability

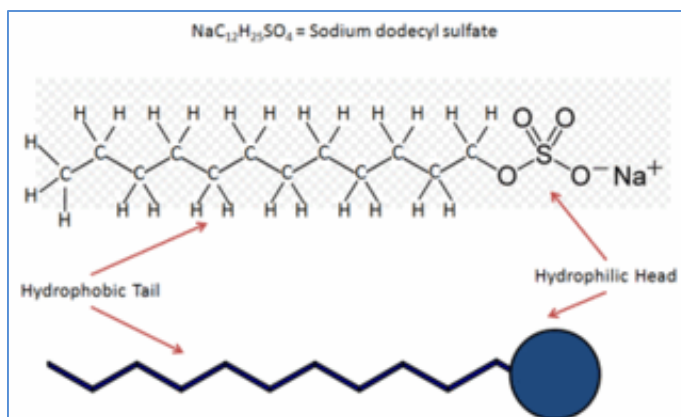
Low viscosity
Low cost



IONIC LIQUIDS AS SURFACTANTS



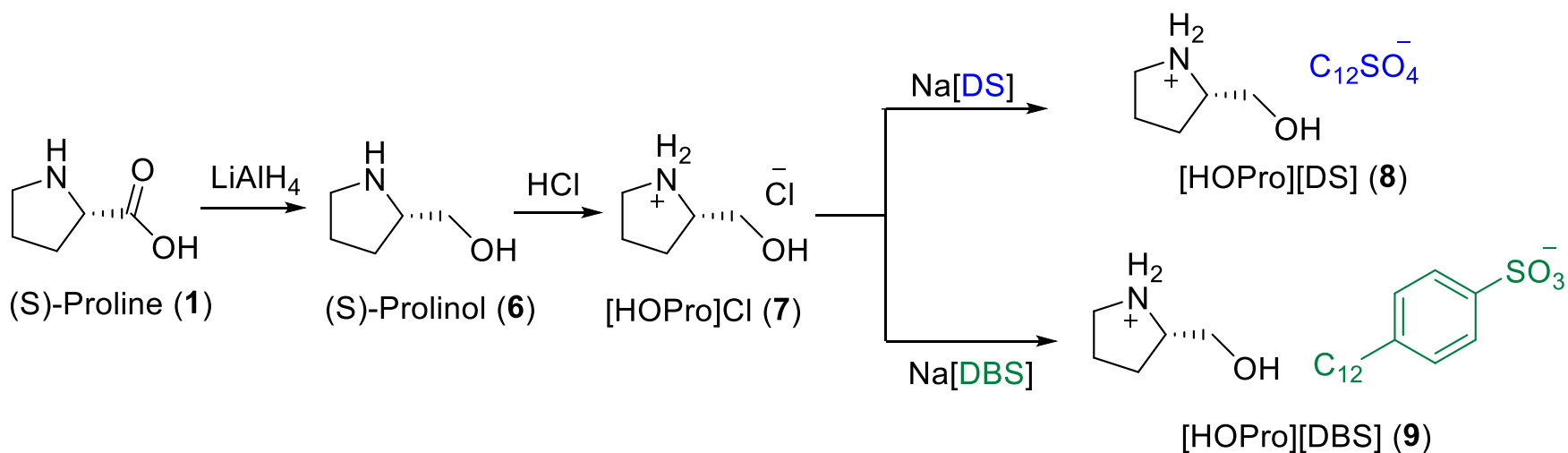
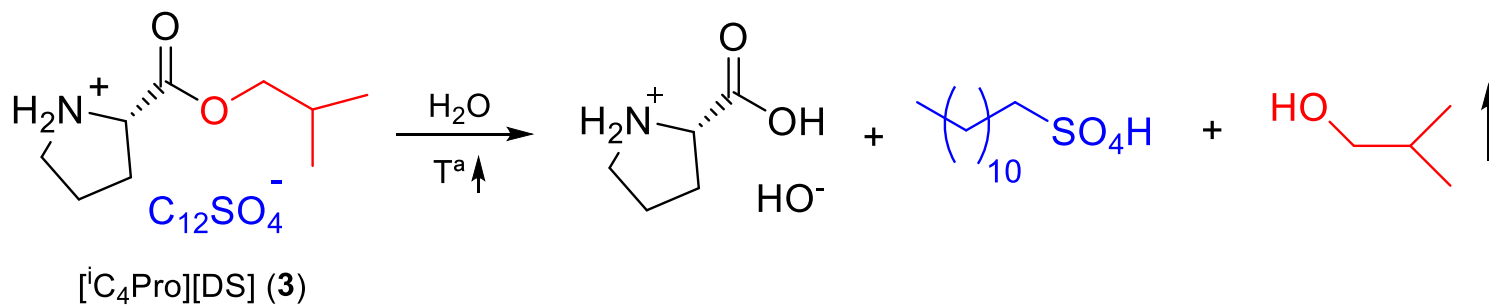
- (2) [ⁿC₄Pro][DS]
 $\text{R}_1 = \text{C}_2\text{H}_5, \text{R}_2 = \text{H}$
- (3) [ⁱC₄Pro][DS]
 $\text{R}_1 = \text{CH}_3, \text{R}_2 = \text{CH}_3$
- (4) [C₄C₈Pro][DS]
 $\text{R}_1 = \text{C}_6\text{H}_{13}, \text{R}_2 = \text{C}_4\text{H}_9$
- (5) [C₁₀C₁₄Pro][DS]
 $\text{R}_1 = \text{C}_{12}\text{H}_{25}, \text{R}_2 = \text{C}_{10}\text{H}_{21}$



SDS: an anionic surfactant commonly used in domestic cleaning, personal hygiene and cosmetic, pharmaceutical, and food product.



NEW PROLINOL-BASED IONIC LIQUIDS AS SURFACTANTS





Active Pharmaceutical Ingredients (APIs)

Bioavailability



Solubility

Permeability
across cell
membranes

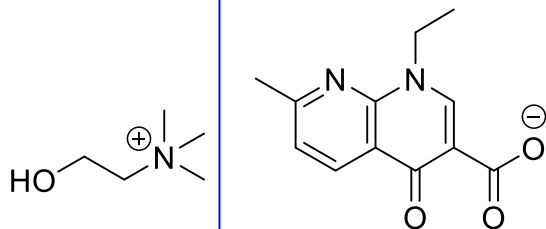


- Low solubility in water
- Polymorphism

It is estimated that up to 70 % of the drugs under development fail because they do not have the required solubility properties.

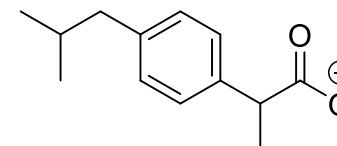
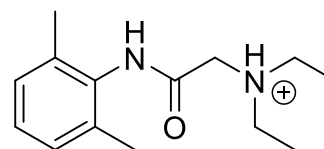


API iónico: nalidixato



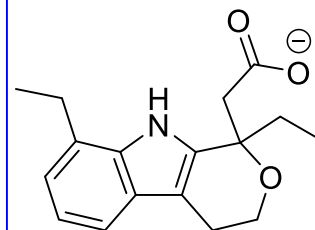
API iónico como anión: nalidixato de colinio

API iónico: lidocainio



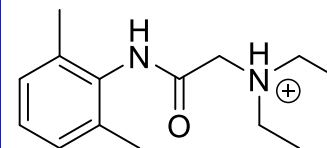
API iónico como catión: ibuprofenato de lidocainio

API iónico: etodolaco



API-IL con un API iónico como anión y un API iónico como catión:
etodolaco-lidocaina

API iónico: lidocainio





Acknowledgements

THANKS FOR YOUR ATTENTION !!

Acknowledgements:



XUNTA DE GALICIA



EXIL-Exchange on Ionic Liquids (COST European Cooperation in Science and Technology)