15th International Conference on the Chemistry of Se &Te
Universidade Federal de Santa Catarina, Florianópolis – Brazil
Nov 28 - Dec 02, 2022 – Hotel Jurerê Beach Village – www.iccst15.com.br

Chalcogens synergism in organic synthesis: A case study

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Helicenes and heterohelicenes are challenging chiral structures that continuously stimulate new interest and find new applications in asymmetric synthesis, medicinal chemistry and, above all, material science. We showed that thia-bridged triarylamine[4]helicenes can be prepared using consecutive regioselective electrophilic sulfur insertions on triarylamine or *N*-arylphenothiazine skeletons. Due to the length of the four carbon-sulfur bonds, these peculiar systems belong to the rare and valuable family of stereochemically stable [4]helicenes, showing *M*/*P* racemization barriers as high as 30 Kcal/mol. Thia-bridged triarylamine[4]helicenes can be easily and reversibly mono-electronically oxidised to the corresponding, exceptionally stable, radical cations that have been obtained as single (*M*) and (*P*) enantiomers. While studying their applications in polymer chemistry and in electronic devices based on the Chiral Induced Spin Selectivity (CISS) effect, we are investigating a new synthetic approach exploiting chalcogen containing Lewis Bases (Ch-LB) as suitable catalysts. In fact, using easily available enantiopure Ch-LB it is possible to control the absolute stereochemistry of the heterohelicenes. This chalcogens synergism in organic synthesis will be described and discussed.