Topic: Synthesis of chiral amino lactone through “Memory of Chirality” concept.

Introduction:

“Memory of chirality” can be defined as a phenomenon in which the chirality of a starting material having a chiral sp³ - carbon is preserved in the reaction product even though the reaction proceeds at the chiral carbon as a reaction centre through reactive intermediates such as carbanions, singlet monoradicals, biradicals, or carbenium ions.

Matsumura, Y. et al

“Memory of chirality” signifies asymmetric transformation in which the chirality of the starting materials is preserved in the configurationally labile intermediates (typically enolates) during the transformation.

Kawabata, T.; Fuji, K.

Snippets from previous work done in this field:

Proposed mechanism:
An early example of work on memory of chirality:


**The Present Work:**

The reaction scheme of the present project is as follows.

This reaction follows an SN2 type mechanism involving the attack of the carboxylate anion onto the carbon of 1,2-dibromoethane.
2.5 eq. Et₃N; 1.2 eq. (Boc)₂O
DCM; 24 hrs.

1 eq. LDA
-50 to 0 degree Celsius
20 hrs. at 0 degree Celsius

LDA = 1:1 BuLi + Diisopropylamine in THF
Boc = [Diagram of Boc group]
In the present scheme of reactions, the memory of chirality is ensured through the axially chiral C - N bond of the enolate anion. Due to this chirality, the attacking carbon atom gets a directionality, which makes the final product have an optical activity and prevents complete racemization.

The chiral amino lactones may have great biological significance due to their chirality.

**The Present State of the Project:**

The reactions were done for various amino acids like L-phenylglycine, L-phenylalanine, L-leucine, L-alanine, etc.

L-Alanine: \[ R = \text{CH}_3 \]

L-Leucine: \[ R = \text{CH}_2 \text{CH}_3 \]

L-Phenylglycine: \[ R = \text{CH}_2 \text{C}_6\text{H}_4 \]

L-Phenylalanine: \[ R = \text{C}_6\text{H}_5 \]

The NMR reports confirmed the presence of the various intermediate products as shown above.

The resolution of the compounds by HPLC for calculating the enantiomeric excess would be done later.

**Learnings from the Project:**

From this project, I have learnt the art of conducting experiments, how to handle various reagents. The most exciting part, according to me, was getting to see and appreciate the approach that is taken in synthetic chemistry for solving various problems.

Amongst the experimental topics, I have learnt:

i. The process of setting up reactions.

ii. How to work-up a reaction with moisture sensitive reagents in anhydrous conditions and extract the crude product from the reaction mixture.

iii. How to purify a compound by column chromatography. The principles behind chromatography.

iv. How to distill reagents.

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