CHAPTER-V (SCOPE AND OBJECTIVE)

Among plethora of functional groups, the nitrone functionality has secured an important place in the arsenal of synthetic chemists. This was possible largely owing to the brilliant efforts of Huisgen and his group in Munich have resulted in major advances in the entire panorama of 1,3-dipolar cycloaddition reactions. Houk and his co-workers are responsible for the pioneering investigations of regioselectivity and stereospecificity associated with the 1,3-dipolar cycloaddition. Finally Eschenmoser and his collaborator in Zurich made a brilliant contribution by discovering the $\alpha$-chloro nitrone $^{189-191}$. Another new vista of the nitrone chemistry is the $\alpha$-amino nitrone $^{2,192}$. The molecule constitutes 4-centered-6-electrons-$\pi$-system and is expected to be unstable, therefore, an attempt has been made (in Chapter-I) to investigate the stability by HMO approximation. Although this simple theory has provided a qualitative guide for the preparation and the reactivity phenomena of the nitrone. Yet for the prediction of regioselectivity in 1,3-dipolar cycloaddition reaction, CNDO/2 or ab initio SCF calculations have tremendous scope. Theoretical work field in this field now in progress.

Direct synthesis of $\alpha$-amino-N-cyclohexyl nitrone from formamide is interesting because Eschenmoser et.al. prepared the DMF nitrone by an indirect route. Now there is an ample scope to improve the yield of the nitrone. Lately, the nitrone was purified and used for the substitution reactions with alkyl halides.
P. Gygax\textsuperscript{193} in his Ph.D. dissertation, elegantly established that the oxa-aza-ene (VII) in six-membered ring, undergoes smooth transformation to (VIII) in 3 hrs at 60\degree C, while the N-methylated system (IX) remained unchanged.

\begin{align*}
\text{(VII)} & \xrightarrow{3 \text{ hrs.} \atop 60\degree C} \text{(VIII)} \\
\text{(IX)} & \xrightarrow{120 \text{ hrs.} \atop 60\degree C} \text{NO Change}
\end{align*}

Formation of five-membered oxa-aza-ene system and their facile transformation were first demonstrated by Huisgen and later the formation of aziridine ring was confirmed by Baldwin\textsuperscript{173} in a separate example. The average bond energy calculation also supports the above facts, because the balance of energy is 44 Kcal/mole towards the right side:

\begin{align*}
\Sigma 424 \text{ K.cal/mole} & & \Sigma 468 \text{ K.cal/mole}
\end{align*}
Though no such change was observed in the five membered oxa-aza-ene of α-amino-N-cyclohexyl nitron, yet, extensive investigation is needed.

Another important aspect of the α-amino-N-cyclohexyl nitron is the facile displacement reaction at room temperature with alkyl halides. Here the lone pair of the N-atom, α- to the nitron group plays a trick. The new nitron has a tremendous scope, to study the pericyclic reactions. Similarly, one can also study the formation of Meisenheimer complex by the nitron to the electron deficient ring systems.

While studying the 1,3-dipolar cycloaddition reactions of α-amino-N-cyclohexyl nitron with ethyl and methyl cinnamate it was found that both the cycloadducts were unstable and dissociated probably due to (3 + 2 \[\rightsquigarrow\] 5) cycloreversion.

Finally, a thorough study of the (3 + 3 \[\rightsquigarrow\] 6) dimerisation-cycloreversion of α-amino-N-cyclohexyl nitron could open the question as to whether the cycloaddition reactions are concerted or a two-step process.