SOME SYNTHETIC USES OF GRIGNARD REAGENTS

"Action of Grignard reagents on
trans- β -aroyl-N-alkylacrylamides"

By

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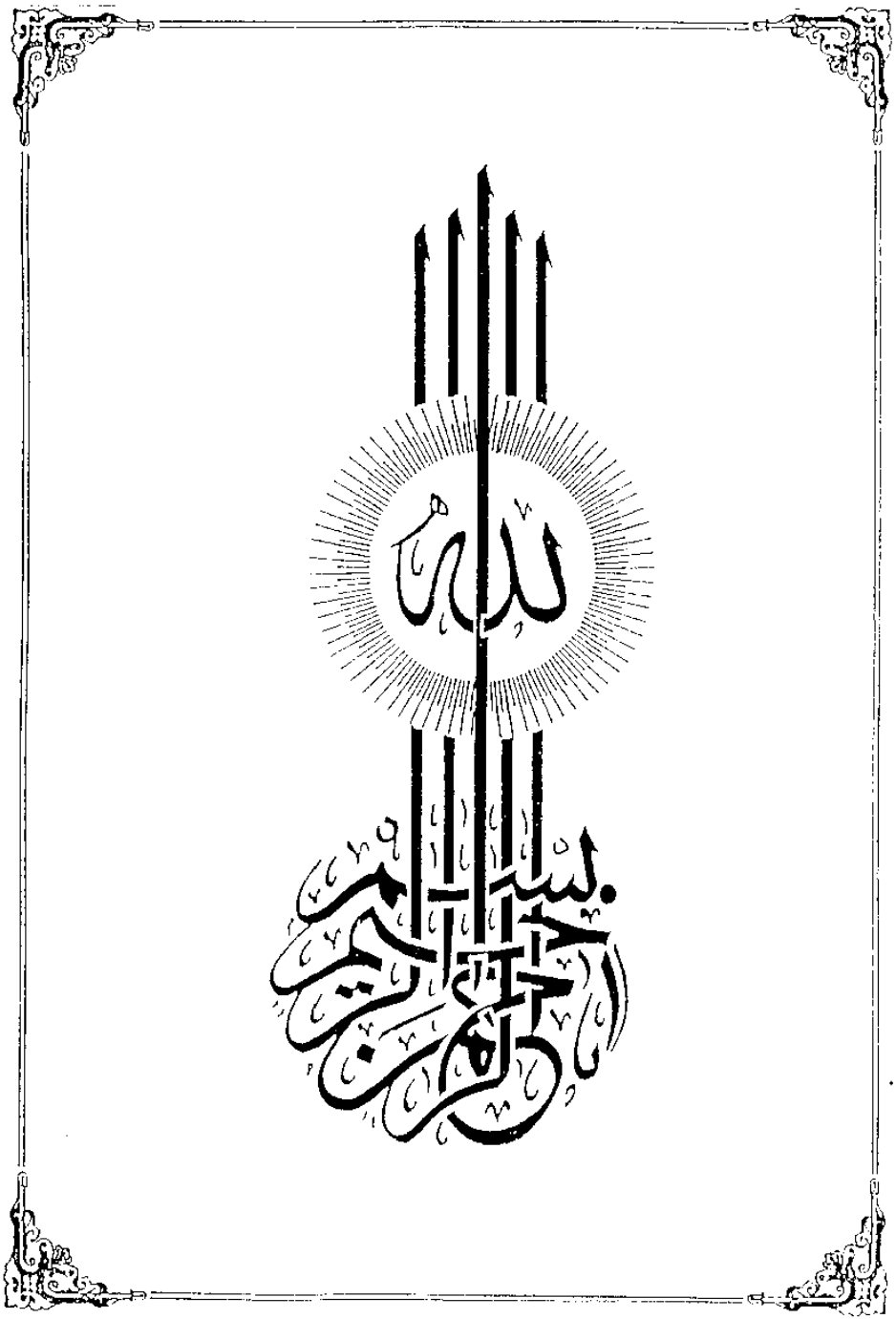

Besides the work carried out in this thesis, the candidate attended postgraduate courses for two years in this following topics:

1) Mechanism of Organic Reactions.
2) Electronic, Infrared, Nuclear Magnetic Resonance, Raman and Mass Spectroscopy of Organic Molecules.
3) Organic Microanalysis.
4) Chemistry of Heterocyclic Compounds.
5) Organic Reactions.

She passed successfully an examination in this topics.

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A C K N O W L E D G E M E N T

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C O N T E N T S

SUMMARY

S U M M A R Y

Action of Grignard Reagents on trans-β-Aroyl-N-alkyl-acrylamides

The present investigation deals with the action of different Grignard reagents on trans-β-aroyl-N-alkylacryl-amides.

trans-β-Aroyl-N-alkylacrylamides (LVIIIa-h) are synthesised by the action of trans-β-aroylacryloyl chlorides (from trans-β-aroylacrylic acids and phosphorous pentachloride) with different amines in ether at room temperature. The structure of these compounds was confirmed by a study of their infrared spectra which show sharp NH and two C=O stretching frequencies and their electronic spectra which show strong bands at $\lambda_{max.}$ 250-281 nm.

Action of methylmagnesium iodide:-

Methylmagnesium iodide reacts with trans-β-aroyl-N-alkylacrylamides to give β-aroyl-α-methyl-N-arylpropionamides (LX). This structure has been confirmed by a study of their infrared spectra which show sharp NH and two C=O stretching frequencies and their electronic spectra which show strong band at wavelengthes similar to that absorved in case of unconjugated aroyl groups. The structure was

further confirmed by melting point and mixture melting point experiments with an authentic sample of β-p-toluoyl-α-methyl-N-benzylpropionamide (LXb) prepared by the reaction between the corresponding acid chloride and benzylamine.

Action of ethylmagnesium iodide:-

Ethylmagnesium iodide reacts with (LVIII) to give β-aroyl-α-ethyl-N-alkylpropionamides (LXI). The structure was confirmed by a study of their infrared and electronic spectra and by giving coloured pyrylium derivatives confireming the position of the ethyl group.

Action of phenylmagnesium bromide:-

Phenylmagnesium bromide reacts with (LVIII) to give β-aroyl-α-phenyl-N-alkylpropionamides (LXII). The structure of these compounds was inferred from a study of their infrared and electronic spectra which are very similar to those of β-aroyl-α-methyl and α-ethyl-N-alkylpropionamides, and by the fact that they gave coloured pyrylium compounds. Their structure was further confirimed by melting point and mixture melting point experiments which an authentic sample

of (LXIIf), prepared by the reaction between β-p-chloro-benzoyl-α-phenylpropionyl chloride (from the corresponding acid and PCl_5) and benzylamine.

The investigation was extended to include the action of phenylmagnesium bromide on trans-β-benzoyl-N-N-diphenyl-acrylamide (prepared from the corresponding acid chloride and diphenylamine) in order to study the relative reactivity of the α,β-unsaturated ketonic and amide systems. However the reaction was found to involve the 1,4-addition to the α,β-unsaturated ketonic system to give (LXIII) as the only crystallisable product.

LIST OF NEW COMPOUNDS

List of New Compounds

1) trans-β-Benzoyl-N-benzyl-acrylamide (LVIIIa).
2) trans-β-Benzoyl-N-N-diphenylacrylamide (LXIII).
3) trans-β-p-Toluoyl-N-benzylacrylamide (LVIIIb).
4) trans-β-p-Toluoyl-N-secbutylacrylamide (LVIIIc).
5) trans-β-p-Toluoyl-N-tertbutylacrylamide (LVIIId).
6) trans-β-p-Chlorobenzoyl-N-benzylacrylamide (LVIIIe).
7) trans-β-p-Chlorobenzoyl-N-n-butylacrylamide (LVIIIf).
8) trans-β-p-Chlorobenzoyl-N-secbutylacrylamide (LVIIIg).
9) trans-β-p-Chlorobenzoyl-N-tertbutylacrylamide (LVIIh).
10) β-Benzoyl-α-methyl-N-benzylpropionamide (LXa).
11) β-p-Toluoyl-α-methyl-N-benzylpropionamide (LXb).
12) β-p-Toluoyl-α-methyl-N-tertbutylpropionamide (LXd).
13) β-p-Chlorobenzoyl-α-methyl-N-benzylpropionamide (LXe).
14) β-p-Chlorobenzoyl-α-methyl-N-n-butylpropionamide (LXf).
15) β-p-Chlorobenzoyl-α-methyl-N-secbutylpropionamide (LXa).
16) β-p-Chlorobenzoyl-α-methyl-N-tertbutylpropionamide (LXb).
17) β-Benzoyl-α-ethyl-N-benzylpropionamide (LXIa).
18) β-p-Toluoyl-α-ethyl-N-benzylpropionamide (LXIb).
19) β-p-Toluoyl-α-ethyl-N-secbutylpropionamide (LXIc).
20) β-p-Toluoyl-α-ethyl-N-tertbutylpropionamide (LXId).
21) β-p-Chlorobenzoyl-α-ethyl-N-benzylpropionamide (LXIe).
22) β-p-Chlorobenzoyl-α-ethyl-N-n-butylpropionamide (LXIf).

23) β-p-Chlorobenzoyl-α-ethyl-N-secbutylpropionamide (LXIg).

24) β-p-Chlorobenzoyl-α-ethyl-N-tertbutylpropionamide (LXIh).

25) β-Benzoyl-α-phenyl-N-benzylpropionamide (LXIIb).

26) β-Benzoyl-α-phenyl-N-diphenylpropionamide (LXIIa).

27) β-p-Toluoyl-α-phenyl-N-benzylpropionamide (LXIIc).

28) β-p-Toluoyl-α-phenyl-N-secbutylpropionamide (LXIId).

29) β-p-Toluoyl-α-phenyl-N-tertbutylpropionamide (LXIIe).

30) β-p-Chlorobenzoyl-α-phenyl-N-benzylpropionamide (LXIIf).

31) β-p-Chlorobenzoyl-α-phenyl-N-n-butylpropionamide (LXIIg).

32) β-p-Chlorobenzoyl-α-phenyl-N-secbutylpropionamide (LXIIh).

33) β-p-Chlorobenzoyl-α-phenyl-N-tertbutylpropionamide (LXIIi).

GENERAL PART

COMPOSITION OF GRIGNARD REAGENT

The composition of Grignard compounds has been the subject of much study and controversy.[1,2] Although many suggestions have been made concerning the composition of Grignard compounds, only two of these received much attention. The first suggestion made by Grignard[3] and later supported by Meisenheimer[4], was that the Grignard compounds are best represented by the formula RMgX. The second suggestion was made by Jolibois[5] and involved the representation of Grignard compounds by the formula $R_2Mg.MgX_2$. The first convincing evidence permitting a clear-cut choice between these formulations was presented in 1957 by Dessy and co-workers.[6] They found no exchange between $^{28}MgBr_2$ and $(C_2H_5)_2Mg$ and presented evidence that an equimolecular mixture of $MgBr_2$ and $(C_2H_5)_2Mg$ has the same characteristics as the Grignard reagent prepared from C_2H_5Br and Mg. Thus, it was concluded that alkyl exchange does not take place in diethyl ether and that the RMgX species does not exist in solution and therefore Grignard compounds are best represented by the structure first suggested by Jolibois, namely, $R_2Mg.MgX_2$.