

REPORT

UGC MINOR RESEARCH PROJECT 2007-2009

Title: **“Ultrasound – An effective technique for Heterocyclic transformation”**

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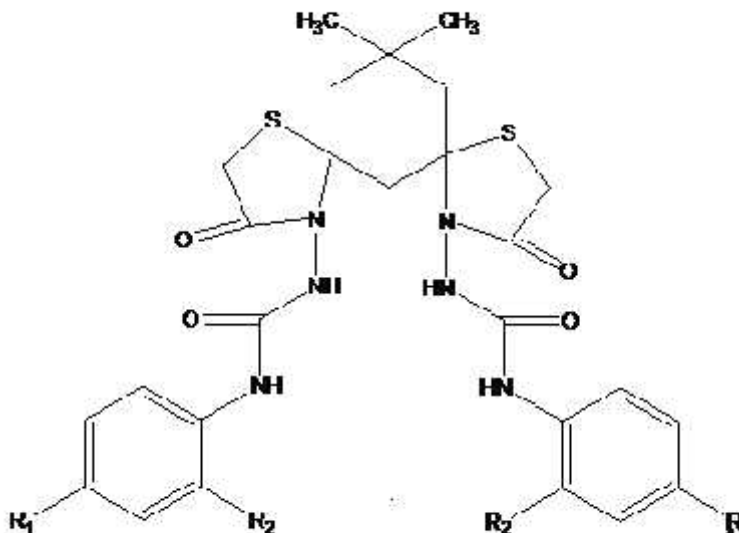
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It was in 1986, that the first ever International Symposium on Sonochemistry was held at Warwick University UK as part of the Autumn Meeting of the Royal Society of Chemistry¹. This meeting was the beginning of serious interest in the uses of ultrasound in chemistry. Of course sonochemistry dates back much further than this. Its origin can be traced to the early part of this century with the discoveries of echo sounding and the mechanical use of power ultrasound for emulsification. The formation of the Royal Society of Chemistry Sonochemistry Group in 1987 followed by a European Society in 1990 and then other national groups has meant that the subject has expanded greatly over the last few years. Range of applications for the uses of ultrasound in chemistry have been listed which includes synthesis, environmental protection (the destruction of both biological and chemical contaminants) and process engineering (improved extraction, crystallisation, electroplating and new methods in polymer technology). The use of ultrasound in chemistry offers the synthetic chemist a method of chemical activation which has broad applications and uses equipment which is relatively inexpensive. The driving force for sonochemistry is cavitation and so a general requirement is that at least one of the phases of the reaction mixture should be a liquid. When laboratory research in sonochemistry began it seemed to be mainly a method of initiating intransigent reactions especially those which depended upon the activation of metallic or solid reagents. Its development in the past 15 years however has revealed that it has far wider applicability than this and also that it presents a significant scientific challenge to understand its underlying physical phenomenon—acoustic cavitation. The ever expanding number of applications of sonochemistry in synthesis has made the subject attractive to many experimentalists and interest has spread beyond academic laboratories into industry and chemical engineering²⁻⁶. In the following work novel heterocyclic compounds are synthesized using ultrasound technique.

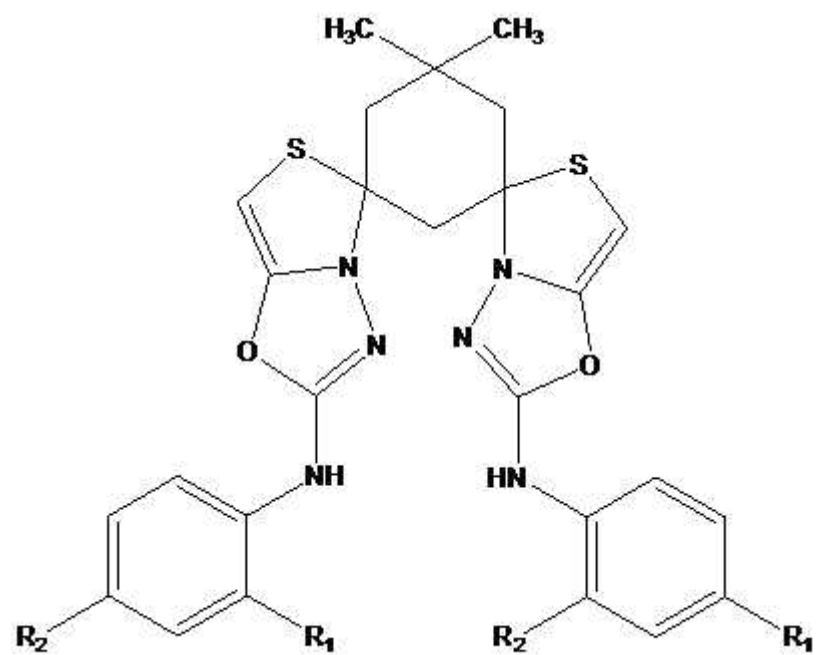
Scheme 1: It deals with the synthesis of 3,9-dioxo-4,8-di-(3'-aryl)carbamid-13,13-dimethyl-1,11-dithia-4,8-diaza-bispiro[4.1.4.3]tetradecane (**I**), Bisipro-5,5-dimethyl {cyclohexan-1,2':3,2''-di-(1,3-thiazolo-4-en)[3,4-b]-2-arylamino}-1,3,4-oxadiazole (**II**), 1,3-bis-imino[-1-(carboxy)-4-substitutedphenylthiosemicarbazid]-5,5-dimethyl cyclohexane (**IV**), 1,3-bis-imino[5-(substituted)phenylamino-1,3,4-thiadiazol-2-yl]-5,5-dimethylcyclohexane (**V**), 1,3-bis-imino[-4-(substituted)phenyl-5-mercapto-1,2,4-triazol-3-yl]-5,5-dimethylcyclohexane have synthesized from 1,3-bis-substituted phenyl semicarbazone-5,5-dimethylcyclohexane and 1,3-bis-acidhydrazide-5,5-dimethylcyclohexane (**III**) has been reported by sonication technique as well as by traditional thermal method.

Scheme 2: In continuation of our work on synthesis of bis compound we here by report the detailed study of bis-1,5-[acetoxyl]-3,3-dimethyl-1,4-cyclohexadine, bis-1,5-[(substituted)cinnamate]-3,3-dimethyl-1,4-cyclohexadine (**VI**), bis-1,5-[2',3'-dihydro-4'(substitutedphenyl)-1',5'-benzothiazipin-2'-oxy]-3,3-dimethyl-1,4-cyclohexadine (**VII**), bis-1,5-[-2',3',4',5'-teterahydro-2'-(substitutedphenyl)-4'-oxo-thiophen-3'-carboxylate]-3,3-dimethyl-1,4-cyclohexadine (**VIII**) and 1,4-dihydro-4(substituted phenyl)-2,6-dimethyl-3,5-diacetyl-pyridine (**IX**)

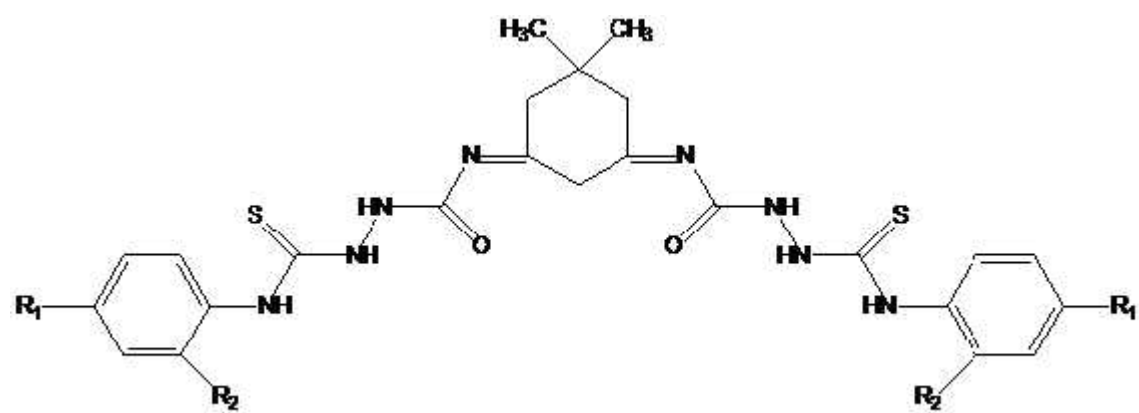
Scheme 1



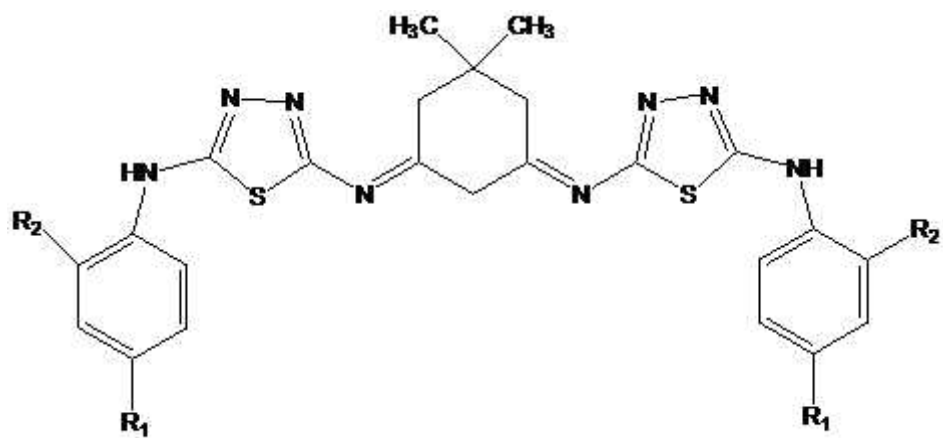
(I)



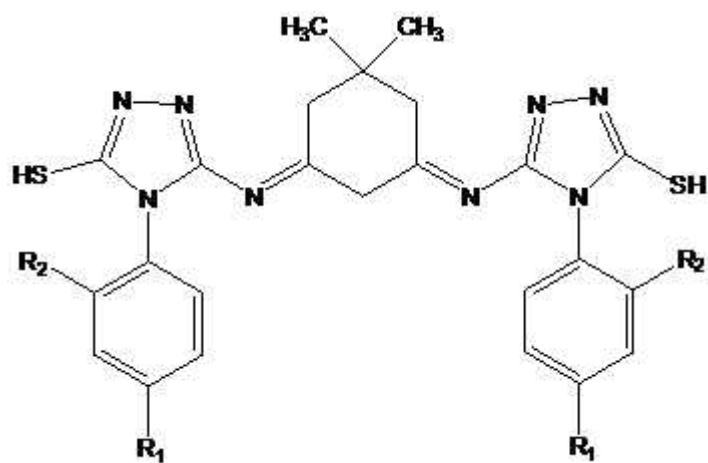
(II)



(III)

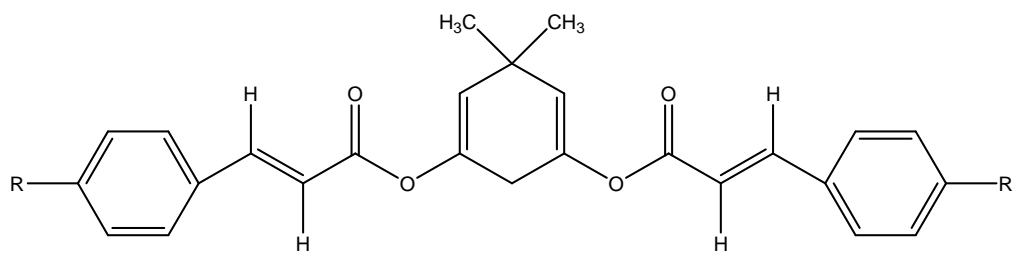


(IV)

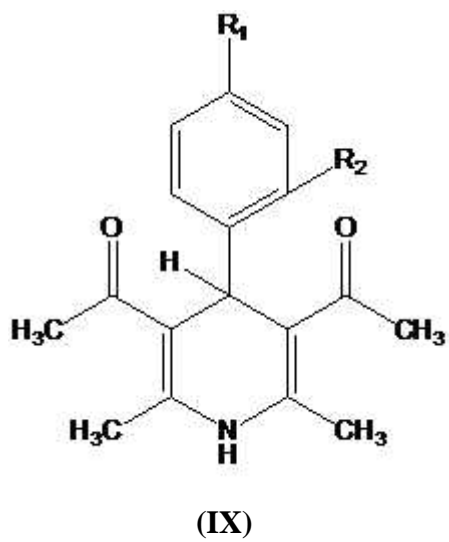
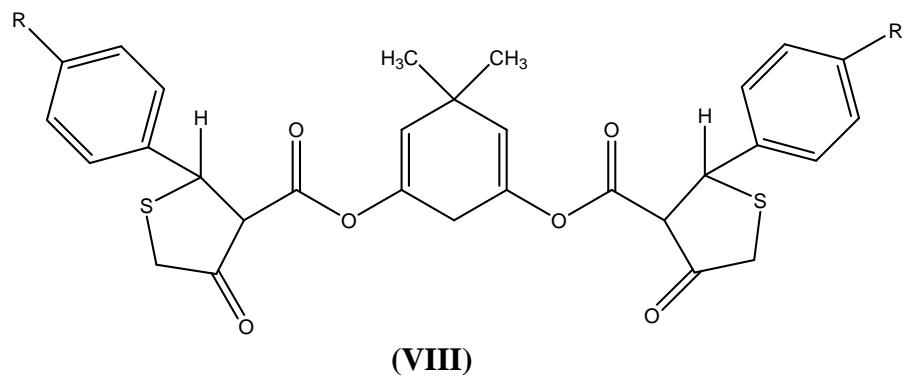
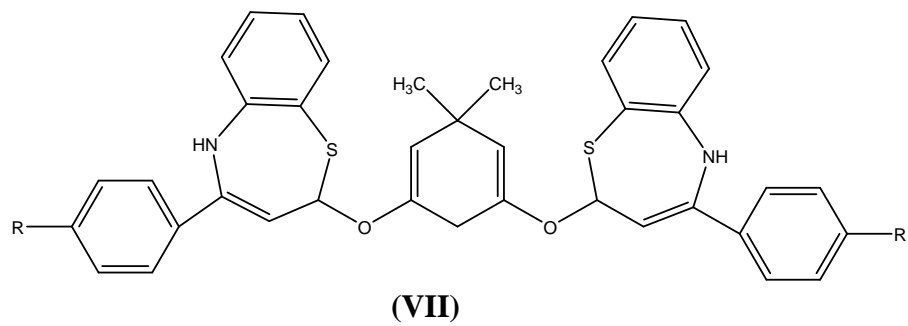


(V)

Scheme 2:



(VI)



Conclusion:

The Project has helped to prepare potential active compounds; library of heterocyclic compounds has been made. One Ph.D. student is under training and will be awarded degree. The Project will also result in more than five publications.

References:

- 1 Mason T. J and Lorimer J. P, *Sonochemistry, Theory, Applications and Uses of Ultrasound in Chemistry*, Ellis Horwood Publishers, Chichester, **1988**.
- 2 K. S. Suslick, *Ultrasound, its physical, biological and chemical effects*, VCH, Mannheim, **1988**.
- 3 Einhorn C, Einhorn J and Luche J.-L, *Synthesis—Stuttgart*, **1989**, 787.
- 4 Mason. T. J, *Sonochemistry: The uses of ultrasound in chemistry*, *Royal Society of Chemistry*, Cambridge, **1990**.
- 5 Price. G. J, *Current trends in sonochemistry*, *Royal Society of Chemistry*, Cambridge, **1993**.
- 6 Special edition of the Journal Ultrasonics covering the RSC Sonochemistry Symposium, Warwick **1986**.

Acknowledgement:

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