

UNIVERSITY GRANTS COMMISSION  
BAHADUR SHAH ZAFAR MARG  
NEW DELHI – 110 002.

**Annual/Final Report of the work done on the Major/Minor Research Project. (Report to be submitted within 6 weeks after completion of each year).**

1. Project report No. **Final**
2. UGC Reference No. **F.No. 32-223/2006(SR)**
3. Period of report: from **1.4.2007 to 31.3.2010**
4. Title of research project **“Charge transfer complexes of 7,7,8,8-tetracyanoquinodimethane with meso-porphyrin based systems.”**
5. (a) Name of the Principal Investigator **Dr. Paramjit Kaur**

(b) Deptt. and University where work has progressed

**Department of chemistry, Guru Nanak Dev University, Amritsar.**

6. Effective date of starting of the project **1.4.2007**
7. Grant approved and expenditure incurred during the period of the report:
  - a. Total amount approved **Rs. 6,56,000/-**
  - b. Total expenditure **Rs. 5,81,574/-**

Report of the work done: (Please attach a separate sheet)

- (i) Brief objective of the project **Ann. A**
- (ii) Work done so far and results achieved and publications, if any, resulting from the work (Give details of the papers and names of the journals in which it has been published or accepted for publication **Ann. B**
- (iii) Has the progress been according to original plan of work and towards achieving the objective. If not, state reasons **Yes**
- (iv) Please indicate the difficulties, if any, experienced in implementing the project. **Nil**
- (v) If project has not been completed, please indicate the approximate time by which it is likely to be completed. A summary of the work done for the period (Annual basis) may please be sent to the Commission on a separate sheet **NA**

(vi) If the project has been completed, please enclose a summary of the findings of the study. Two bound copies of the final report of work done may also be sent to the Commission **Ann. B**

(vii) Any other information which would help in evaluation of work done on the project. At the completion of the project, the first report should indicate the output, such as (a) Manpower trained (b) Ph. D. awarded (c) Publication of results (d) other impact, if any **The project fellow appointed in the scheme is working for her Ph.D degree. For Publications see the Ann. B**

**SIGNATURE OF THE PRINCIPAL  
INVESTIGATOR**

**REGISTRAR**

**Ann. A**

**Objectives:**

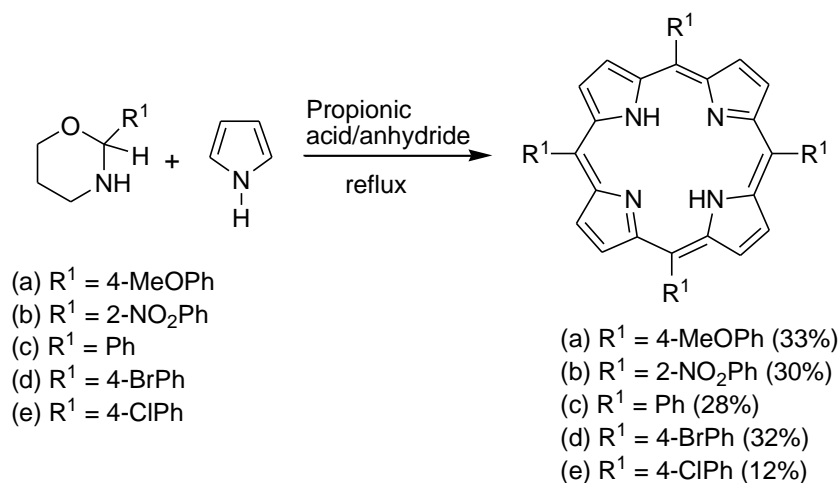
The present project proposal had two objectives:

1. Synthesis of metal chelates using tetraaza based stable ligands such as *meso*-porphyrins and related scaffolds, and formation of their CT complexes with TCNQ based acceptor molecules.

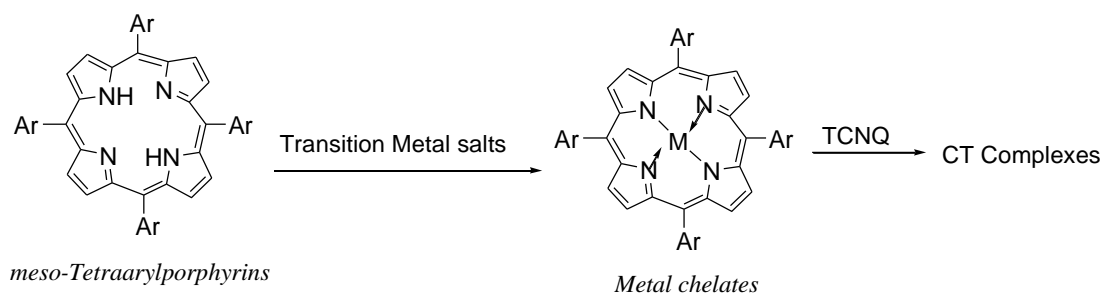
2. Structural characterisation with major emphasis to the magnetic and electrical properties for evaluating their efficacy in the field of material chemistry.

## Ann. B

In this project we had planned to synthesize *meso*-porphyrins and related scaffolds, and formation of their charge-transfer (CT) complexes with TCNQ based acceptor molecules and to evaluate their properties. In this direction the following porphyrins have been synthesized:



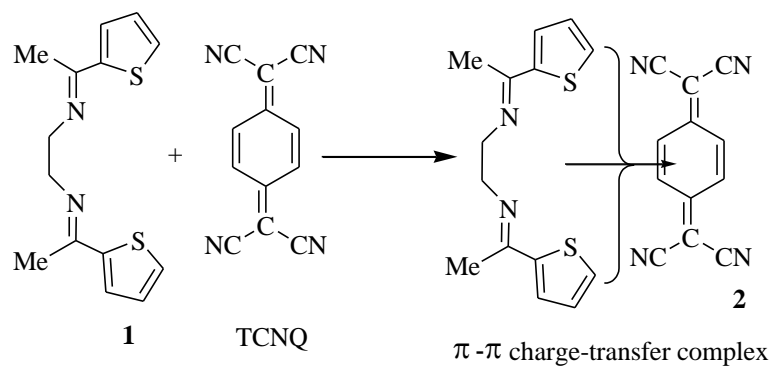
**Scheme-1.** Synthesis and yields of *meso*-tetraarylporphyrins obtained from oxazinanes.



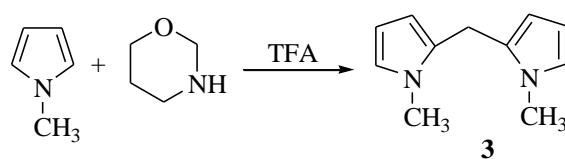
**Scheme-2.** Formation of CT complexes with TCNQ.

However while preparing their CT complexes it was realized that it will be worth investigating similar properties of their intermediates i.e. dipyrromethanes and to use these intermediates for possible sensing applications. Thus the compounds listed in chart-1 were synthesized and evaluated for their application as chemical sensors for different analytes:

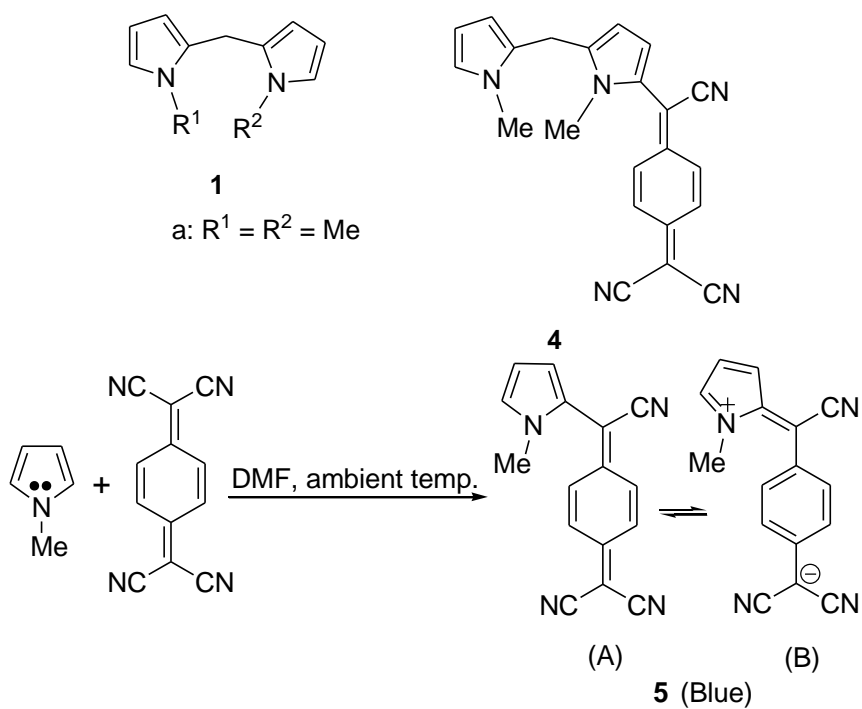
Chart 1:



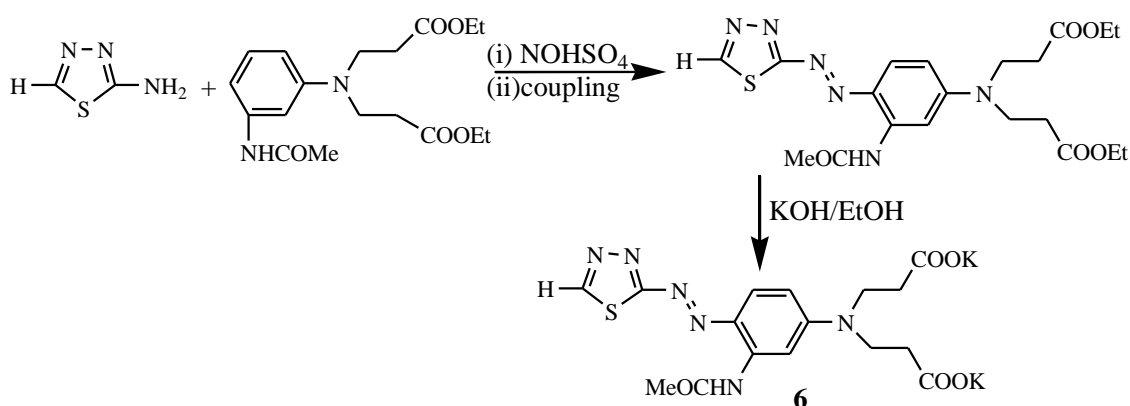
The compound **2** was found to be selective for  $\text{CO}_3^{2-}$  and  $\text{PO}_4^{3-}$



The compound **3** was found to be selective for  $\text{Cu}^{2+}$  and the resulting  $\text{Cu}^{2+}$ -**3** complex detected  $\text{CN}^-$  from aqueous medium.



The compounds 4 and 5 were found to be selective for  $F^-$  and  $Hg^{2+}$  in the aqueous medium. In addition to these a hetarylazo dye was prepared which was found to be selective for  $Zn^{2+}$  and  $Hg^{2+}$  in aqueous medium



#### Publications out of this work:

1. Synthesis of *meso-aryl* substituted porphyrins. Simple and high yielding modification of the Adler Procedure. Kamaljit Singh, Amit Sharma, Sonia Behal and Paramjit Kaur, *Letts. Org. Chem.*, **2007**, 4, 374.
2. A selective and sensitive ‘naked eye’ anion detector based on an imine- $\pi$ -TCNQ assembly, Paramjit Kaur, Sandeep Kaur and Kamaljit Singh, *Tetrahedron Letters*, **2007**, 48, 7191-7193.
3. Highly selective colorimetric sensor for  $Zn^{2+}$  based on hetarylazo derivative. Paramjit Kaur, Sandeep Kaur, Aman Mahajan and Kamaljit Singh, *Inorg. Chem. Commun.*, **2008**, 11, 626.
4. An efficacious “naked-eye” selective sensing of cyanide from aqueous solutions using a triarylmethane leuconitrile, Paramjit Kaur, Divya Sareen, Sandeep Kaur and Kamaljit Singh, *Inorg. Chem. Commun.*, **2009**, 12, 275.
5. Colorimetric detection of cyanide in water using highly selective  $Cu^{2+}$  chemosensor, Paramjit Kaur, Sandeep Kaur and Kamaljit Singh, *Inorg. Chem. Commun.*, **2009**, 12, 978.
6. Novel Unsymmetrical Charge-transfer Compound of N-Methylpyrrole with TCNQ - A Highly Selective  $Hg^{2+}$  dosimeter. Synthesis, Sensing and Mechanistic Rationale, Paramjit Kaur, Sandeep Kaur, Yoganjaneyulu Kasetti, Prasad. V. Bharatam and Kamaljit Singh (Communicated).

7. A Fluoride selective Dipyrromethane-TCNQ colorimetric sensor based on charge-transfer, Paramjit Kaur, Sandeep Kaur and Kamaljit Singh (Communicated)