

**REPORT OF THE NATIONAL SEMINAR ON MODERN TRENDS IN CHEMISTRY  
HELD ON 22 AND 23 JANUARY 2015 AT ST. JOSEPH'S COLLEGE ,IRINJALAKUDA**

The national seminar on 'Modern trends in chemistry' was conducted at St. Joseph's college Irinjalakuda, Kerala on 22 and 23 January 2015. There were teachers and students from nearby colleges . The seminar was intended to give an insight into the modern trends in chemistry and inspire the young minds into research field. The objectives of the seminar were to bring students from various colleges to one platform for discussing and presenting the recent developments in chemistry. It provided an opportunity for them to interact, discuss and exchange their ideas with each other and with the eminent resource persons. Well experienced resource persons were able to motivate and induce research aptitude in students by sharing their personal experience over the years in research . They were able to convince that by strong determination and hard work the students could conquer new horizons in the fast advancing chemical field.

The inauguration function started at 9.30 am in the seminar hall with a prayer song, followed by welcome speech by Dr. Jessy Emmanuel, coordinator of the seminar. Dr. C.V. Krishnan Rtd. Professor of chemistry inaugurated the function with the lighting of lamp. In his key note address he gave his testimony of researching the various levels in research field which encouraged the students to pursue research as their carrier. Dr. Annie C.F concluded with vote of thanks. The function was witnessed by an audience of strength of about 300 which included the participants, faculty members of the department of our college, PTA members and students.

After the tea break, classes started at 10 am. Dr. C.V Krishnan, Rtd. Professor of Chemistry, Stony Brook University, New York delivered the first lecture. He dealt with importance of admittance measurement for understanding various types of ion-ion interactions in different solute- solvent interactions in biological systems. He explained the applications of admittance and impedence measurements. The session ended at 12.30 pm with the vote of thanks by Dr. Mathew Paul Ukken faculty from Christ college. From 12.30- 1.15 pm there was lunch break.

The next lecture was by Dr. A. Sreekanth from NIT, Trichy. He discussed various topics in organo metallic chemistry which included agostic interactions transmetallation, ligand substitution, coordination, insertion and  $\beta$ -hydride elimination. He also discussed about molecular receptors and different spectral methods like mass spectra , IR spectra ,COSY ,ROSY , maldi etc. which are helpful structural methods in organometallic chemistry. He also demonstrated using Isopro 3.1 .The session got over by 3.30 pm . After a short tea break, there was paper presentation till 5.00 pm.

The second days started with paper presentation from 8 :15 am till 9.30 am. Then after a tea break, there was the lecturer by Prof. K.L Sebastain from IISc.

Bangalore. He discussed two topics firstly he explained the energy transfer that takes place in complex systems. Then he dealt with the new research works in theoretical chemistry and about biomotors and their functioning with reference to ATPase synthesizing ATP molecules. After his lecture there was a lunch break at 12.30 pm to 1.15 pm. After that Dr. K.K. Mohammed Yusuff, Emeritus Scientist (KCSTE) CUSAT gave an interesting lecture on spin cross over in transition metal complexes. At 3.30 pm we had paper presentation till 5.00 pm. Then was the concluding session in which the participants expressed their views regarding the conduct and content of the seminar. The lectures and presentations were well appreciated by all the participants. They were truly benefited and enriched with new facts and concepts. Evaluation forms were filled by all the participants. They expressed their satisfaction and gratitude towards the conduct of the seminar. And the whole programme ended by 5.30 p.m. in a good note.

The following are a brief note on the four lectures that were delivered during the seminars.

#### **Prof. C. V. Krishnan**

Our interest in aqueous sodium chloride was necessitated by recent interests in biological electronic circuits involving DNA (or RNA or proteins)-salt-water interactions. We have chosen mercury as the working electrode because past electro-capillary measurements for different electrolytes were primarily being carried out using mercury. Also, it was relatively easy to get a fresh drop of mercury each time and thus to minimize surface inhomogeneities. The mercury drop approach also offered opportunities to study the influence of surface area more easily because the size of the drop could be easily changed. We had reported earlier results of proteins, collagen and prothrombin, and observed the profound influence of NaCl on their electronic behavior. While NaCl promoted the electronic behavior of collagen, it was detrimental on prothrombin as evidenced by the occurrence of impedance loci in the first two quadrants, a characteristic of negative differential resistance and probable resonant tunnel diode behavior. We had also reported the admittance and impedance behavior of aqueous 0.010 M KCl, KBr, and KI using a static mercury drop electrode. As expected, the interaction of mercury was observed to increase from chloride to bromide to iodide near the passivation region. Both p-type and n-type semiconduction in these systems could be observed from Mott-Schottky plots. Differential capacity measurements and electrocapillary measurements of alkali halides, their mixtures, and tetraalkylammonium iodides have been utilized to study the nature of specific adsorption at the double layer.

#### **Dr. A. Sreekanth**

Organometallic chemistry is the study of chemical compounds containing at least one bond between a carbon atom of an organic compound and a metal. Organometallic compounds are widely used in homogeneous catalysis. The metal-carbon bond in organometallic

compounds is generally of character intermediate between ionic and covalent. Organometallic compounds with bonds that have characters in between ionic and covalent are very important in industry, as they are both relatively stable in solutions and relatively ionic to undergo reactions.

Ferrocene was first prepared unintentionally. Pauson and Kealy, cyclopentadieny-MgBr and FeCl<sub>3</sub> (goal was to prepare fulvalene) But, they obtained a light orange powder of "remarkable stability, later according to the aromatic character of Cp<sup>-</sup> groups. The sandwich compound structure was described later; this led to new metallocenes chemistry (1973 Nobel prize, Wilkinson & Fischer). The Fe atom is assigned to the +2 oxidation state (Mössbauer Spectroscopy). The bonding nature in (Cp)<sub>2</sub>Fe allows the Cp rings to freely rotate, as observed by NMR spectroscopy and Scanning Tunneling Microscopy Fluxional behavior. (Note: Fe-C bond distances are 2.04 Å). 1955 - Cotton and Wilkinson (of the Text) discover organometallic-complex *fluxional behavior* (stereochemical non-rigidity). The capability of a molecule to undergo fast and reversible intramolecular isomerization, the energy barrier to which is lower than that allowing for the preparative isolation of the individual isomers at room temperature. It is conventional to assign to the stereochemically non-rigid systems those compounds whose molecules rearrange rapidly enough to influence NMR line shapes at temperatures within the practical range (from -100 °C to +200 °C ) of experimentation. The energy barriers to thus defined rearrangements fall into the range of 5-20 kcal/mol (21-85 kJ/mol).

#### **Prof. K.L Sebastain**

The process is assumed to be driven by the adsorption of the polymer on the inner surface of the vesicle. Partition functions for chains adsorbed on the inside and outside have been calculated. We argue that in the case where the polymer is adsorbed on the outer surface too, the entropic barrier for translocation is absent - thus weak adsorption on the outer surface facilitates translocation to the inside. We analyze the adsorption energy and find the free energy profile for the process. We argue that the motion corresponds to a polymer crossing a region with a change in free energy per segment. Based upon our analysis of the behaviour of kinks in such a problem (see below), we conclude that the translocation can occur with a crossing time proportional to the length of the chain.

#### **Dr. K.K. Mohammed Yusuff**

The spin-crossover (SCO) phenomenon was first discovered more than 60 years ago by Cambi et al. Since this discovery there has been numerous compounds of Fe<sup>II</sup> (3d<sup>6</sup>), Fe<sup>III</sup> (3d<sup>5</sup>) and Co<sup>II</sup> (3d<sup>7</sup>) reported in the literature exhibiting this phenomenon both in the solid state and in solution. SCO centres are of interest because they are one of the best-known forms of an inorganic electronic switch. Within the large community of researchers involved with molecular sciences one major objective is to study compounds that have the ability to be photo-piezo-, and/or thermo-stimulated. Such a research axis merges in the broad context of the development

of candidate materials for incorporation in devices devoted to the treatment of information and data storage; their use as smart X-chromic pigments; and to be envisaged as molecular engines or molecular switches. The key property of such stimuable molecular compounds is their "bi-stability". This property characterizes a distinctive class of transition metal complexes of the first period (3d) exhibiting the ability of switching between two spin states of 3d electrons, the High Spin state (HS) and the Low Spin state (LS). The observed physical change is known as the Spin Cross-Over (SCO) phenomenon.

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