Abstract No: 867 ***Natural Sciences***

REVERSIBLE VAPOCHROMIC PROPERTIES OF SPIROPYRANS TOWARDS PHENOL VAPOUR IN SOLID STATE

U.G.R. Lakmali[1, 2], A. Wickramasinghe[2] and C.V. Hettiarachchi[2]*

[1]Postgraduate Institute of Science, University of Peradeniya, Sri Lanka
[2]Department of Chemistry, Faculty of Science, University of Peradeniya, Sri Lanka
**champikav@pdn.ac.lk*

Spiropyrans are an extensively studied group of organic photochromic compounds. They can undergo ring opening reactions by either photochemically or thermally depending on the substituents attached. Ring closed spiro (SP) form is colourless and the ring opened merocyanine (MC) form is intensely coloured. However, as ring closing back reaction is very fast at ambient temperature, MC form cannot be seen for unsubstituted and halo substituted compounds. Thus, photochromism has been observed for them only below -100 ^{0}C in the solid form.

However, in the present study, it was able to observe reversible vapochromic properties for unsubstituted and three halo substituted spiropyrans in the solid state. Four films of spiropyrans were prepared on glass slides and exposed to phenol vapour saturated in a closed glass container. Time taken to appear the colour on the films and then disappearance of that colour from the films when taken out of the container were considered as the visible parameter to monitor the rate of ring opening and closing of spiropyrans. Furthermore, KBr pellets containing 5% of samples were prepared and exposed to phenol vapour for one hour to observe the FT-IR spectral changes before and after reaction with phenol vapour.

Upon reacting with phenol vapour, all films were turned into purple colour less than two minutes in the order of SPH>SPBr>ClSPH>ClSPCl. However, ring closure rate was observed in the order of ClSPH>SPH>SPBr>ClSPCl as a result of the disappearance of the colour from the films. After exposure to phenol vapour, FT-IR spectroscopic data clearly showed peak broadening around 3500 cm^{-1}and 1250 cm^{-1}in SPH and SPBr due to the formation of hydrogen bonds in MC-phenol adduct and cleavage of the spiro C-O bond respectively. According to the results, it is clear that phenol can trigger solid state ring opening of spiro form in the absence of external energy and formation of hydrogen bonds further stabilize coloured MC form. When phenol evaporates from the films, MC form can convert to colourless SP form. The response time vary with the presence and the position of the substituents, as it can change the electron withdrawing ability and the polarity of MC form. Therefore, spiropyrans can be used as a good sensor material for detecting phenol vapour in the atmosphere in the presence of other volatile organic compounds, as the vapochromic property was observed only with phenol.

Financial support from the HETC Win 3 QIG is acknowledged.