

## Synthesis, Photophysical Characterizations and Ion-Sensing behavior of Double-Squaraine Dyes

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Sensitive detection of metal ions is of utmost importance for the industrial, environmental and health care monitoring. An optimum concentration of metal ions is necessary to maintain the various biological processes, their imbalance lead to several ailments. Amongst various metals, Lead (Pb) is highly poisonous heavy metals leading to several diseases in human such as anemia, neurological and kidney disorders [1]. This necessitates the determination of lead in biological and environmental samples in order to monitor the environmental pollution and clinical diagnosis. Therefore, design of suitable  $\text{Pb}^{2+}$  ion detection probes having especially in the near infrared (NIR) wavelength region elevates the prior sample processing making them highly suitable for bio-sensing applications.

In this work, we have designed N-alkyl substituted benzindole based novel squaraine dyes bearing double squaric acid moiety in the same molecule and variable alkyl chain length. The newly designed ion-sensing probes have been successfully synthesized, characterized (FAB-MS/ NMR) and subjected to the photophysical investigations including the ion-sensing. Ion sensing in terms of nature of metal ions was investigated spectrophotometrically using electronic absorption and fluorescence emission spectroscopy.

Designed probes has been found to exhibit Solvatochromic behavior, which was associated with differential aggregation of probe in different solvent. At the same time, it is relatively more sensitive to divalent metal ions as (Mg, Ca, Pb) compared to its monovalent ion counterparts (Na, K) having highest sensitivity with the  $\text{Pb}^{2+}$  ions. It can be seen from the Fig. 1 that in acetonitrile/DMF solvent mixture, exhibit purple color having dominant absorption between 500-600 nm. On the other hand, upon addition of  $\text{Pb}^{2+}$  ions, there is decrease in the intensity of the purple color and clear absorption in higher wavelength NIR region between 650-800 nm leading to clearly visible change in color from purple to Cyan (inset of Fig. 1). It is worth mention here, increase in the alkyl chain length from ethyl (C2) to dodecyl (C12) led to the enhancement in the  $\text{Pb}^{2+}$  ion sensitivity. Details about the synthesis of these novel probes, their structural as well as photophysical characterizations, aggregation behavior and ion-sensing will be discussed during my presentation.

### References:

1. S. Araki, H. Sato, K. Yokoyama and K. Murata, Am. J. Ind. Med., 2000, 37, 193

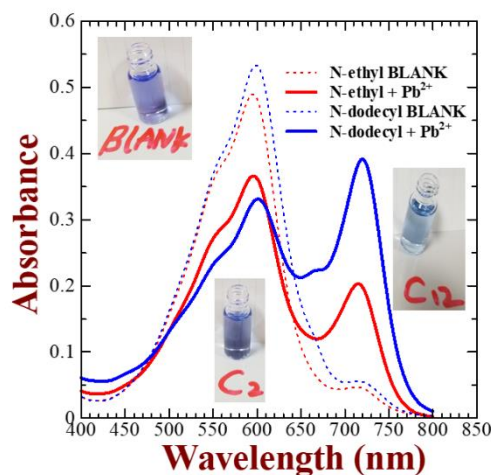


Fig. 1. Electronic absorption spectra of newly designed probe in Acetonitrile/DMF (99:1) solution (10  $\mu\text{M}$ ) in the presence and absence of  $\text{Pb}^{2+}$  ions. Inset shows color change of the probe solution in the presence and absence of ions.