Self-Indicating, Simultaneous, Multianalyte recognition using an Ionic Liquid

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INTRODUCTION:

We present the work done here on a multifunctional system for recognition of metal ions based on the Ionic Liquid (IL) trihexyltetradecylphosphonium dicyanamide [$P_{6,6,6,14}$] [DCA].

This Liquid is capable of co-ordinating with a given heavy metal through its anion**[1]**.

It is through the chemistry of this IL that we present a system capable of *self-indicating, simultaneous, multianalyte recognition* of heavy metal ions such as Cu^{2+} and Co^{2+}. When incorporated into a polymer (PVC) membrane, this system maintains all these attractive features with the added bonus that the IL is now *self-plasticizing*.

The resulting system is an optode containing only 2 components (PVC and IL) as opposed to a classical 5-component optode (PVC, plasticizer,ionophore,ion-exchanger,dye).

In order to characterize the system structurally, we present both IR and Raman spectra obtained for the complexation of these metals to the IL.

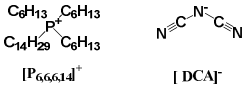

Fig 1: The IL used in this study; trihexyltetradecylphosphonium dicyanamide

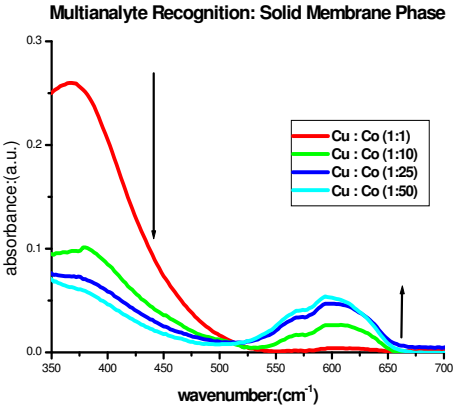

Fig 2: A simple case of multianalyte recognition based on two distinct absorption maxima. By varying the ratio of each metal in a given mixture; we have noted an inverse relationship.

By increasing the amount of Co^{2+} in the mixture; an incremental increase in absorbance values are seen @600nm; with a complementary decrease seen @ 370nm for Cu^{2+}.

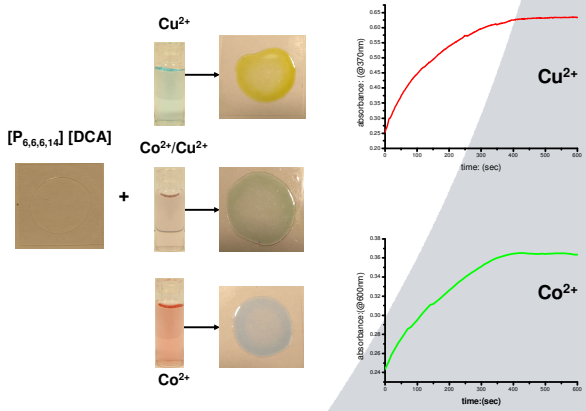

Fig 3 : i)Shown above are the colour changes seen when Co^{2+} and/or Cu^{2+} is added to [$P_{6,6,6,14}$] [DCA].
ii) Kinetic Data obtained for the complexation of Co and Cu to $[DCA]^-$ in a self-plasticized PVC membrane.

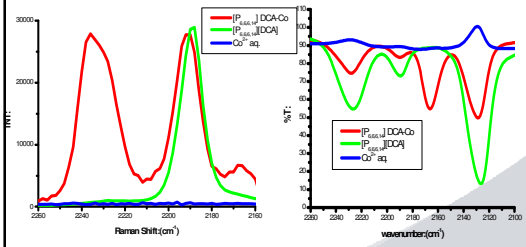

Fig 4: Vibrational spectra obtained for the complexation of Co^{2+} to $[DCA]^-$. Cobalt can bind with $[DCA]^-$ through its terminal cyanide nitrogen atoms, cyanide stretches move to higher energies upon metal-ligand complexation.

CONCLUSION:

We have presented here a novel system for simultaneous recognition of heavy metals. It is a key representation of the many attractive features of these emerging new class of compounds. This work can also be viewed as a building block for future chemical sensing platforms, where multifunctionality can be incorporated *into* the sensor, thereby reducing the amount of components needed.

ACKNOWLEDGEMENT:

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LITERATURE:

[1] Hvastijova, M. Kohout, J., *Transition Metal Chemistry.*, Vol. 18, Issue 6, pg. 579-582**, 1993**

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