

Colorimetric chemosensor based on 1,3-bisdicyanovinylindane

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Introduction

Efficient detection and sensing function of metal ions are important aspects in the design of chemosensor for biological and environmental applications. Among them, mercury pollution has been considered as an important issue because of its severe immunotoxic, genotoxic, and neurotoxic effects. Also copper can be a toxic to biological systems when the level of copper ions exceeds the cellular needs. Therefore, many scientists have been devoted to the development of new chemosensors for the detection of mercury and copper ions with sufficient selectivity. In this work, we have synthesized new chemoesensor dye, namely 1,3-bisdicyanovinylindane, which is an appropriate compound due to solubility function in acetonitrile, methanol or water under alkali solution.

Experimental

The 1,3-indandion and malononitrile were purchased from Aldrich. All other metal ions were purchased from Aldrich and Samchun. A mixture of 1,3-indandion (3mmol, 0.452g) and malononitrile (9mmol, 0.793g) in ethanol(25ml) was placed and stirred at room temperature for 15min. Then, sodium acetate (0.007mmol, 0.574g) have added into the mixture. The reaction mixture was refluxed for 3h. After the reaction was complete, the mixture which was blue solution was cooled to room temperature. The process scheme for 1,3-bisdicyanovinylindane was showed in Fig 1.

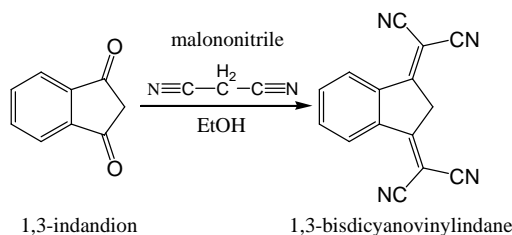


Fig. 1 Preparation of 1,3-bisdicyanovinylindane

A Completed compound and metal ions were dissolved in acetonitrile or methanol/water mixture.

Then, the absorption properties on 1,3-bisdicyanovinylindane in acetonitrile or mixture of water and methanol were measured by UV-spectrophotometer. Also, the absorption of 1,3-bisdicyanovinylindane with addition of metal ions was measured by UV-spectrophotometer.

Results and discussions

The absorption intensity of 1,3-bisdicyanovinylindane decreased with increasing metal ions which is copper and mercury.

To determine the transition range for colour change of this dye indicator, the measurement of absorption was carried out at 580nm with addition of dilute metal ions solution.

Conclusions

We have synthesized 1,3-bisdicyanovinylindane that is a selective chemosensor and its behavior was observed towards addition of toxic metal ions, such as copper and mercury. Other ions such as iron, palladium, and aluminum were also detected by 1,3-bisdicyanovinylindane. However, 1,3-bisdicyanovinylindane showed highly selective and sensitive chemosensor effects for the detection of copper and mercury ions.

Acknowledgements

This research was financially supported by the Ministry of Education, Science Technology (MEST) and Korea Industrial Technology Foundation (KOTEF) through the Human Resource Training Project for Regional Innovation.

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