

**Short Communication****Greener Identification of Cd in presence of Cu in Qualitative Analysis****A.V. Prasada Rao¹ and K. Deepthi^{2*}**1. Department of Inorganic and Analytical Chemistry, Andhra University, Visakhapatnam, **INDIA**2. Department of Chemistry, Adikavi Nannaya University, Rajahmundry, **INDIA**Email: deepthikorabandi@gmail.comAccepted on 11th August, 2021**ABSTRACT**

Cations identification in Qualitative analysis is tiresome and involves use of harmful and toxic reagents. When comes to the case of identification and confirmation Cu and Cd, use of KCN, H₂S is unavoidable which are toxic. The present method describes the use of less toxic reagents like K₄[Fe(CN)₆] and K₃[Fe(CN)₆] for the identification of Cd in presence of Cu.

Keywords: Qualitative analysis, Cd, Cu, Greener identification, use of K₄[Fe(CN)₆], K₃[Fe(CN)₆] etc.

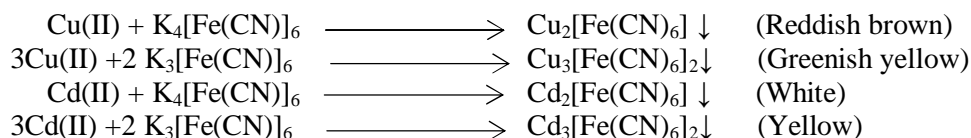
INTRODUCTION

For identification of cations in qualitative analysis, Cu(II) and Cd(II) are precipitated as sulphides in HCl medium in 2nd group along with Pb and Hg [1-4]. Detection of Cd in presence of Cu poses a severe problem because both these ions exhibit the same type of reactivity in several reactions. Typical text book procedure [5] indicates identification of Cd(II) in presence of Cu(II) by making use of KCN because [Cu(CN)₄]¹⁻ is a more stable complex compared to [Cd(CN)₄]²⁻ so that when H₂S is passed through the mixed solution, CdS alone gets precipitated preferentially, leaving Cu(II) in solution as soluble cyano complex. Several other schemes were also reported for identification of Cd(II) in presence of Cu(II). King. E .J [6] reported the use of sodium dithionite and sodium acetate; but dithionite is unstable in aqueous solution and requires preparation of reagent freshly every time which may not be practical [7]. Mattney Cole Jr and William Waggoner [8] suggested that CdS dissolves in 6M HCl and on addition of K₄[Fe(CN)₆] yields a pale yellow precipitate of Cd₂[Fe(CN)₆] which looks more like colloidal dispersion of sulfur and causes a confusion. Hayden and Hunt [9] reported a different method for separation of Cu from Cd based on conversion of Cu (II) to Cu (I) using an iodide-thiocyanate solution to form a light colored precipitate CuSCN. Addition of Na₂S₂O₃ discharges the color of the solution due to iodine. Addition of dil. ammonia and ammonium sulphide to the above solution then yields CdS. Recently Siddhwani and Chaudhury [10] reported detection of Cd through a spot-test using Fe(α,α'-dipy)I₂, which gives a red spot in presence of KI. In ammonical medium Cu, Co, and Ni do not interfere. This being a spot-test, may not be of use in regular macro or semi-micro qualitative analysis. All the above reported processes are not safe because, use is made of either highly poisonous KCN or toxic H₂S or other sulfur yielding compounds.

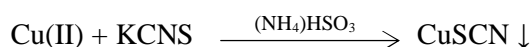
In view of the above, the present authors report a simple green reaction for the facile identification of Cd(II) in presence of Cu(II) without using either KCN or H₂S. The test is based on the following two observations.

MATERIALS AND METHODS

First, both Cu(II) and Cd(II) give characteristic colored precipitates with K₄[Fe(CN)]₆ and K₃[Fe(CN)]₆ as shown below:



Second, Cu(II) undergoes reductive precipitation with ammonium bisulphite and KSCN [9].



RESULTS AND DISCUSSION

The test is conducted as follows: To the mixed solution of Cu(II) and Cd(II), add ammonium bisulphite followed by addition of potassium thiocyanate reagent. Cu(II) selectively gets reduced to Cu(I) and gets precipitated as CuSCN, leaving Cd(II) in solution. Separate the solution and add K₃[Fe(CN)]₆ reagent. Yellow precipitate occurs due to the formation of Cd₃[Fe(CN)]₆. This way we can separate and confirm the presence of Cu(II) and Cd(II) from a mixed solution in qualitative analysis.

REFERENCES

- [1]. G. Svehla, Vogel's Qualitative inorganic analysis, 7th ed., Pearson Education, New Delhi, **2006**.
- [2]. J. C. Kuriacose, J. Rajaram, The physical chemistry of inorganic qualitative analysis: A Laboratory Manual; Tata McGraw-Hill, **1972**.
- [3]. V. V. Ramanujam, Physical Chemistry of inorganic qualitative analysis; The National publishing company, India, Chennai, **1974**.
- [4]. G. L. Miessler, D. A. Tarr, Inorganic Chemistry, 3rd ed.; Pearson Education: New Delhi, **2005**.
- [5]. A. I. Vogel, A text book of quantitative inorganic analysis, 3rd ed. ELBS & Longman p.480.
- [6]. E. J. King., Ionic reactions and separations, Harcourt Brace Jovanovich, Inc., Ny, **1973**.
- [7]. T. Moeller, Inorganic Chemistry, John Wiley and Sons Inc., New York, **1982**, p.535.
- [8]. G. Mattney Cole, Jr, W.H. Waggoner, Qualitative analysis-The Current Status, *J. Chem. Educ.*, **1983**, 60(2), 135-140, <http://doi.org/10.1021/cd060p135>.
- [9]. D. W. Heyden, R. I. Hunt, *J. Chem. Edu.* **1982**, 59 Number 1, p.59-60.
- [10]. I. T. Sidhwani, S. Chowdhury, Greener alternative to qualitative analysis for cations without H₂S and other sulfur containing compounds, *J.Chem.Educ.*, **2008**, 85 (8), 1099-1101. <https://doi.org/10.1021/ed085p1099>.