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SENSITIVE CYANIDE INVESTIGATION AND ABOLISHMENT FOR HARMLESS DRINKING WATER

PARAG DALAL

Asst. Prof. School of Studies in Environment Management, Vikram University Ujjain, M.P., India

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ABSTRACT

Cyanide as the name comes shivers the body and soul a bit. Now if we say that there is a possibility of cyanide in your drinking water than, it will take your breath away or your eyes will enlarge, from normal. There are many regulatory bodies throughout the world, which set hard guidelines over the drinking water Cyanide percentage. *Why?* **– To ensure human safety. The typical cyanide measurement requires a calorimetric investigation followed by Spectrophotometric analysis which is very costly and also not available easily. The distillation column was also required pre calorimetric analysis, which adds to the wounds and increases the cost to a big extent. So there is a large need of any alternative analysis of one of the most sensitive elements of drinking water, i.e. Cyanide. A new developed technique of Ion chromatography gives us an idea about the Cyanide percentage and now days is proving highly effective as its running cost is low and the machine is costly but cheaper than the existing system machines. The free flow Cyanide is very dangerous in water as it goes and reacts with multiple human organs and starts their decay leading us to multiple organ failure leading to organ transplant therapy. So as our elders always say** ***"Prevention is better than cure"*****. We also try to analyze Cyanide and then make a decent approach to remove it to keep mankind happy and healthy.**

KEY WORDS : Cyanide, Shivers, Drinking water, Regulatory bodies, Human safety, Drinking Water

INTRODUCTION

Cyanide as the name depicts is well known as one of the highly toxic substances (Dalal, 2021). It's also present naturally in sweet cassava, bamboo shoots, almonds, millets, spinach, soy, sprouts and some beans (Dalal, 2021). The cyanide is present as a part of natural sugar in various fruits and vegetables. Several types of microorganisms, generally bacteria produce natural cyanide including cyano bacteria and rizo bacteria (Dalal *et al.*, 2018). In various industries there are many processes in which cyanide is been used some of them are pesticides, electroplating, plastic, photo developing and mining industries (Dalal, 2018). These coal burning and plastic burning industries liberate cyanide through their stacks in the open environment directly. Generally this free flow cyanide flew through air and gets deposited in soil and surface water (Dalal, 2019). The soil deposition leads to contamination of ground water by leaching from waste sites too (Dalal, 2021).

The government classified cyanide as inorganic hazardous contaminant in drinking water (Dalal, 2021). Since the bottled water is considered in food category, the regulatory authority is different from surface water authority (Dalal, 2021). The Indian government is hard on values and so on percentage of Cyanide in drinking water is set to be as low as 30μg/l still various levels found are more eye opener.

MATERIALS AND METHODS

The cyanide estimation can be done in two ways, i.e. Total Cyanide and Free Flowing Cyanide. The main problematic one is the free flowing cyanide because of its toxicity and natural availability (Dalal, 2021). Generally our emphasis is on controlling the free flowing cyanide so as to control toxicity from effecting the environment and human health (Dalal, 2023). The present methods of estimation of Cyanide have important Drawbacks as the calorimetric method requires a Spectrophotometric method afterwards and distillation method before this method is applied. This complexity is too sensitive for errors and mistakes so this method suffers many drawbacks and is also very costly method. The errors this method provides because of presence of Sulphur in water, presence of oxidizers, presence of Ozone in water, high pH of water etc. are many (Dalal, 2023).

The Ion Electrode method, do not need these types of complex machines and measures, but itself it's a highly matrix sensitive method. This method use direct current from batteries so an ampere meter is superimposed on this too. The DC method has a drawback of electron fouling over time so this method has to complete in the given time lapse compulsorily else it will give large errors.

RESULTS

Various methods have been cited by Sulphide compounds and Sulfide compounds as they react quickly with cyanide to form Thiocyanate complexes. Here the Nitrate and Nitrite both are also problematic as they interfere in the substances and form complexes which are difficult to break. Chlorine, Copper, Iron and other metals react with Cyanide easily and form the complexes difficult to break. In our story reporting, the electron active iodides, sulphates, bromides, thyocyanides, and sulfides are all basic interferences as they are found by the Silver electrode method and can be detected by Cyanide optimized wavelength.

Various Investigations on the effects of dissolved metals like Iron, Copper, and Nickel etc. affects the free cyanide determinations badly and reflects peak in drinking water levels. That's why now a day's various RO companies use Copper in their filters.

Table 1. Effect of Different elements on Cyanide Recovery

Elements	Recovery Percentage	Standard Deviation
Control (None)	100%	±2.5%
Bromide	99%	±2.8%
Iodide	97%	±3.0%
Sulfide	95%	±2.5%
Sulfate	97%	±2.5%
Thiosulfate	94%	±2.7%
Thiocyanate	100%	±2.2%

Disposal of Silver Electrode

Once the electrode cartridge is been fitted, its than used for 21 days and after it is been replaced. The silver from the electrode is been retained by melting method. This all happens after the electrode is continuously used for water purification for 21 days. The average peak areas of Cyanide are 10 µg/l and are affected by the presence of Sodium in water.

Table 2. Effects of Concentration of Cyanide in Ujjain of drinking water supplied

Concentration of Cyanide	Gau Ghat Plant	Sadawal Plant
5 µg/l	80.9 ± 5.5%	87.3 ± 5.5%
10 µg/l	95.9 ± 5.0%	96.7 ± 4.0%
15 µg/l	81.1 ± 3.0%	84.7 ± 3.0%

CONCLUSION

We must ensure the cyanide levels in the drinking water were well under the acceptable limits as it is very critical to human health. The current methods of estimation, i.e. the distillation steps and spectrophotoscopy method possess various human errors and so the Standard Deviation becomes very critical and prone to large amount of errors but instead the method we proposed, i.e. Ion-Selective-Estimation, Silver electrode technique, the errors are less and due to automation of the technique the human errors are gone. So we can say that this method is analytically accurate. Just a single negative point is that we need to stabilize water sample for determination of Cyanide but the method is supportive, productive and capable of Live feeding so it's feasible and helpful to us in every means.

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