Separation Of Heavy Metals: Removal From Industrial Wastewaters And Contaminated Soil Using ICT Technologies and Conventional Method

Nabil Salih*, Abdelkader Aswei*, Khalid Omran*

* Higher Institute of Science and Technology, AL Garaboulli

DOI: 10.29322/IJSRP.10.09.2020.p105105
http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105105

Abstract- This article describes relevant separation techniques for determining the removal of heavy metals from solutions and soils to achieve top quality in this field. Every innovation is quickly identified, regular working conditions are introduced and the innovation is implemented. The techniques described include the chemical precipitation (hydroxide, sulfide reagents or carbonate), coagulation / aggregation, ion exchange, extraction of chelators, soluble extraction, complex formation, electrochemical processes, cementation, includes film processing, evaporation, absorption and coagulation / fixation, glasses . Several narrative examples are given, focusing on ways to reduce waste and treat lead-contaminated soil. The article ends with a brief discussion of important screening requirements in this area.

Index Terms- Heavy Metals, Industrial Wastewaters, Contaminated Soil, ICT Technologies, Conventional Method.

I. Introduction

Various specific methods have been established for removing/saparating heavy metals from sewage and for the treatment of contaminated soil and groundwater. [7] [6]

To remove metals from solution, these unit processes include chemical precipitation (carbonate, hydroxide, sulfide,), coagulation / coagulation, ion exchange, soluble extraction, immobilisation, synthesis, electrochemistry.Includes process, evaporation, filtration, membrane. Some studies are included in the technical publication which summarizes various physical/chemical methods for removing heavy metals. [5] Soil and groundwater can be contaminated with heavy metals through a variety of activities, including industrial waste, compost, and the use of PC_ticid pesticides.[4] For soils that are contaminated with natural toxins, you can consider various measures to treat the specific site, such as: thermal treatment, steam and air removal, chemical oxidation and microbial degradation. [10]

There are fewer treatment strategies for treating soils that contain minerals. In contrast to natural decomposition, metal is not damaged. [6] Minerals are the most important hazardous ingredients that cannot be ground or modified by chemical or high temperature methods proposed by latest interventions of ICT.

It must be processed or transformed into a structure that is as insoluble as possible so that it does not reappear in the soil. [2] [1] [5]

II. DATA TRANSMISSION SYSTEMS

Recently, information and communication technology (ICT) applications are becoming a valuable device for water treatment. Monitoring water quality from ICT is similar to location detection systems, information clouds, and machine learning components. Reserach emphasised the importance of information and communication technologies (e.g. total processing and cloud computing) for the continuous monitoring of the panels and the water quality. [2] [3] Currently, fuzzy conditions are gradually being used in real applications. [11] [12] Distributed computing enables large amounts of information and analysis without the use of computers in the vicinity. [6] One of the main focuses is the remote assessment of information recorded through websites. In addition, remote sensing is one of the most effective methods of collecting field information. [9] [8]

The results indicate several factors that should be considered for the extensive use of on-site detection technology to control water quality (e.g. interoperability, energy consumption, unwavering quality, ease of use, security). [1] First, it highlights the importance of ongoing information and interoperability between device bases to reduce incremental information. Second, the low power consumption of the detection frame is essential for stable information transfer between the field sensor and the information stage. [2]

Third, reliability and ease of use are essential in the information phase. The authors describe the component-rich work phases and limit further efforts to improve information structure planning and to promote outreach innovations. Finally, the importance of adequate security efforts through encryption and authentication procedures is emphasized in order to provide continuous information to the public. Continuous advances in inexpensive wired or remote technologies enable simple and continuous information exchange from electronic information levels and improve the usability of information for water quality management. [4] [5] [6] [7]

III. FINDINGS

The particle size of the absorbent has an incredible impact on the absorption of heavy metals from wastewater. [5] This is because internal diffusion, which is the mass exchange for penetration into the adsorbent, is less restrictive the smaller the particle size. You can easily and practically achieve the full absorption capacity. Larger particles can get so large that they cannot get into the small pores where absorption can be freely reduced for several reasons. [4]

With increasing particle size, longer reaction times are required in order to achieve comparable results due to the diffusion through the agglomerates. [2]

In most cases, the absorption limit to increase absorption increases with increasing metal concentration and reaches a maximum at a certain concentration. [1] [2] [3] The ICT is able to "work on today's problems without affecting the needs of future people", function naturally, and build a conscious future. [5] For example, we can metal mineral particles in water by improving ICT structures and applications, and improving bio-efficiency[5].

By improving the overall structure of information and communication technology, water, electricity, fuel gas, coal, oil and various assets can be appropriately pre-allocated. Sensors implanted in key areas, regions, and urban communities improve monitoring of natural factors and classify key information for decision making. It is important to adhere to a clean and competent disposal of mineral waste in water. Measuring the waste transported by the population is therefore one of the difficulties associated with the idea of an ideal location. [12] [1]

Zinc (Zn)

Organisms require tracer scales for some metal ions such as "zinc (Zn), copper (Cu), and cobalt (Co)" as cofactors for enzymatic manipulation. In any case, the abundance of these mineral ions creates difficult problems for the body due to their high levels of damage, carcinogenicity, and bioaccumulation. [6] Due to its flexible function, zinc is one of the most well-known pollutants in surface and groundwater. Again, liquids containing zinc and strong dispersants are dangerous dispersants due to their biodegradability and heavy toxins. Overdosing on zinc can cause significant medical problems, such as stomach cramps, skin irritation, nausea, and iron deficiency. The World Health Organisation suggests a maximum satisfactory concentration of zinc ions in drinking water of 5. [1] [2]

*Copper (Cu)*Copper (Cu), like zinc, is an integral part of living organisms, including humans, and, in limited quantities, is essential in our diets for staying healthy. [12] In both cases, the consumption of excess copper causes real toxicity problems such as vomiting, stomach cramps, illness and syncope. The World Health Organisation proposes a maximum adequate copper ion concentration in drinking water of 1.5 mg L, whilst the US "Environmental Protection Agency sets 1". [7] [6]

IV. CONVENTIONAL METHODS FOR HEAVY METAL REMOVAL

Heavy metals such as "nickel, copper, zinc, cadmium, chromium, lead and mercury" release metal-polluting wastewater in many companies and are important toxins for new storage facilities. Due to their hardworking, non-degradable and harmful nature, they accumulate in the soil, for example in a developing way of life, and cause real problems of well-being. [11]

Many conventional treatments have been used over the past 20 years to remove heavy metals from contaminated wastewater. The conventional methods include chemical precipitation, ultrafiltration, ion exchange, rotational osmosis, electrolytic winches, herbal medicine, etc. [4] [5] [2]

Chemical precipitation

Chemical precipitation is one of the most commonly used method for saparating/removing heavy metals from inorganic wastewater. The calculation tools included include "metal hydroxides, sulfides, carbonates and phosphates" (highly insoluble particles), the dissolved metal ions of which are accelerated by chemical reagents (precipitants) and can be separated mainly by precipitation or filtration. [1] [5]

Ion exchange

The ion exchange is based on the reverse ion exchange between the strong and the liquid phase. Ion exchangers are strong rubbers which are suitable for exchanging cations and anions in the electrolyte and which provide a counterion with a similar charge with a chemically proportional sum. [6] [7]

Adsorbent	**Containment**	**Adsorbent Dose**	**% Removal**
Xanthated DP Trunk	Pb^{2+}	5	99.4
Raw Date Pits	Cu^{2+}	0.5	90
DP Fiber	Cr^{6+}	5	98.7
Palm Fiber & Petiole	Pb^{2+}	0.5	88
Raw date pits	Cd^{2+}	0.5	65.7
DP leaves	Pb^{2+}	1	94
Modified DP Trunk	Cr^{6+}	1.2	99.95
DP leaf ash	Pb^{2+}	0.5	99.72

Table1

V. ADVANCED DATA ANALYSIS WITH MACHINE LEARNING FOR WATER QUALITY ANALYSIS

The use of electronic information in the disposal and handling of electronic information has recently increased due to the use of sensor information. [6] [5] Various technologies identified through the Internet of Things (IoT) are used to remotely detect and manage derived information.

Easily open and use open source programming dialects to quickly analyse information using high-tech information processing techniques such as machine learning. One of the routine methods of analysing information about water quality is direct regression. [3] [2]

The study examined the spatial distribution of water quality and broke the relationship between water quality and various restrictions. For example urban events or changes in soil properties.

The Krigagem method, which analyses spatial information, provides the best direct and impartial prediction for estimating the center of the river by interpolation and is widely used to estimate groundwater quality. [8] [9] Values of the chloride concentration and the sodium absorption rate in groundwater irrigation using the Krigagem method. [4] [5] "The locally weighted scatter smoothing (LOWESS)" is another information analysis method that analyses information using nonlinear relationships and reformulates a linear regression with normal extensions to give a smooth line fit to nonlinear information. LOWESS is widely used to estimate the concentration of airborne residues based on the emissions information collected on a truck. [6] [7] In either case, the direct regression method is not acceptable for related nonlinear problems such as non-specific source effects and self-cleaning in water systems. [3] [4]

VI. CONCLUSION

The purpose of ICT-based water quality management techniques is to effectively and continuously monitor water quality, predict future water quality standards, and respond quickly to adverse water resource events. The continuous development of advanced information that is revolutionising information analysis, such as: Deep Learning, enables an efficient analysis of large amounts of information over a certain period of time. Much of the information from in-situ field monitoring using innovative discoveries can be combined with modern information analysis techniques such as deep learning to more effectively control water quality.

Therefore, the continuous improvement of these cutting edge technologies for monitoring, sharing information and testing will improve water quality management. Despite the fact that the information collected is shared through new machine learning techniques, many water quality testing systems definitely make standard assumptions for the collection and monitoring of sample manuals. Therefore, in order to find the best solution for water quality management, it is essential to build a continuous monitoring system with sensor technology and implement it together with advanced information analysis strategies such as deep learning.

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AUTHORS

First Author – Nabil Salih, Higher Institute of Science and Technology, AL Garaboulli

Second Author – Abdelkader Aswei, Higher Institute of Science and Technology, AL Garaboulli

Third Author – Khalid Omran, Higher Institute of Science and Technology, AL Garaboulli