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The Study of Lushan Mountain Water Quality

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Abstract: As global pollution increases, natural water sources are becoming contaminated, and species are facing extinction. Lushan Mountain, a tourist destination in Jiangxi, China, boasts a rich history and exceptional natural beauty. Within Lushan Mountain, there is a waterfall named Long-tan. By analyzing the water quality of Long-tan Waterfall, we can understand the extent of pollution in China's natural water sources and the effectiveness of China's efforts to protect its natural beauty.

Compared to other natural water sources in Jiangxi, the water in Lushan contains very few metals, indicating that it is well protected from pollution by tourists, residents, and surrounding factories. Due to the low number of dissolved ions in the water, its conductivity is even lower than that of tap water in China. The high quality of the water makes it a beautiful attraction, drawing visitors from around the world.

Keywords: Water Quality; Lushan; Water Hardness

Introduction

With the increasing intensity of global pollution, natural water sources are becoming contaminated, and species are facing the threat of extinction. Lushan Mountain, a renowned tourist destination in Jiangxi, China, is celebrated for its rich history and exceptional natural beauty. Within Lushan Mountain lies the Longtan Waterfall. By examining the water quality of Longtan Waterfall, we can assess the extent of pollution in China's natural water sources and evaluate the effectiveness of China's efforts to preserve its natural beauty.

1. Materials and method

1.1 Materials and equipment

The experiment method involves several steps:

1. Collection: Gather 500mL of water from Long-tan and divide it into five samples, each containing 100mL.

2. Metal amount: The first sample is analyzed using plasma emission spectroscopy to determine the concentration of various metals.

3. Anion amount: The second sample is passed through a series of ion exchangers to identify the levels of different anions.

4. Alkalinity: The titration method is applied to the third sample using the low alkalinity approach to measure its alkalinity by determining endpoint pH values.

5. Conductivity: The fourth sample's conductivity is measured using the conductivity meter. These methods collectively provide a comprehensive analysis of the water quality in Long-tan Waterfall, thus helping to understand the pollution levels and the effectiveness of preservation efforts in the region.

1.2 Experiment method

The experiment method involves several steps:

1. Collection: Gather 500mL of water from Long-tan and divide it into five samples, each containing 100mL. This step ensures that the samples are representative of the water at the collection site and allows for various analyses to be performed on identical samples.

2. Metal amount: The first sample is analyzed using plasma emission spectroscopy to determine the concentration of various metals. Inductively Coupled Plasma Spectroscopy (ICP) is a powerful technique that can detect trace elements at very low concentrations, making it ideal for evaluating metal contamination in water. The sample is ionized in a plasma torch, and the emitted light is measured to determine the presence and quantity of metals such as aluminum, barium, and boron, among others.

3. Anion amount: The second sample is passed through a series of ion exchangers to identify the levels of different anions. Ion chromatography is used for this purpose, as it is highly effective in separating and quantifying anions in a sample. Anions like chloride, nitrate, and

sulfate are of particular interest, as their presence can indicate different sources of pollution or natural processes affecting water quality [2]..

4. Alkalinity: The titration method is applied to the third sample using the low alkalinity approach to measure its alkalinity by determining the endpoint pH values. Alkalinity is an important parameter in water quality as it reflects the water's ability to neutralize acids. It is measured by titrating the water sample with a strong acid and determining the amount of acid required to reach a specific pH endpoint[3]..

5. Conductivity: The fourth sample's conductivity is measured using the conductivity meter. Conductivity indicates the water's ability to conduct electric current, which is directly related to the concentration of dissolved ions in the water. It provides a quick and general indication of the overall ionic content and can help identify areas of high or low pollution. [4]

2. Results:

2.1 Metal content in water sample:

Table 1 Metal concentration in water sample

Name of Element	Concentration(mg/L)
Aluminum (Al)	<0.05
Barium (Ba)	003
Boron (B)	<0.1
Cadmium (Cd)	<0.01
Calcium (Ca)	6.3
Chromium (Cr)	<0.01
Cobalt (Co)	<0.01
Copper (Cu)	<0.01
Iron (Fe)	<0.05
Lead (Pb)	<0.01
Magnesium (Mg)	0.5
Manganese (Mn)	<0.01
Molybdenum (Mo)	<0.01
Nickel (Ni)	<0.01
Potassium (K)	0.3
Silicon oxide (SiO2)	9.9
Sodium (Na)	1.8
Zinc (Zn)	<0.05
Strontium (Sr)	<0.01
Vanadium (V)	<0.01

2.2 Anion content in water sample

Table 2 Anion concentration in water sample

Name of Anion	Concentration(mg/L)
Cl	0.6
Br	<0.1
NO3	6.0
SO4	3.4

2.3 Alkalinity

Table 3 Alkalinity in water sample

Type of alkalinity	Concentration(mg/L)
Total alkalinity	17
Phenolphthalein alkalinity	<10
Bicarbonate alkalinity	<10
Carbonate alkalinity	<10

2.4 Conductivity of water sample at 25˚C

53(μS/cm)

3. Discussion

3.1Metal

Considering it as a whole, it contains only little metal. Comparing it to another natural water source in Jiangxi: Poyang Lake, its Mn is only about 0.00002 of the concentration of Mn in Poyang Lake and its Cu is about 0.0004. For other elements it contains is also low [5].

An interesting fact is comparing to other element concentration in Long-tan waterfall, silicon concentration is quite high. A study shows the people in "The Longevity Village in Shandong" also drink water with high concentration of metasilicate [6].

Another place in Jiangxi called Ping-Xiang also contain water with high concentrations of metasilicate,[7] this shows Lu-Shan has the potential of containing water with metasilicate and deserves further examination.

3.2 Anions

Its low Cl- concentration indicates it contains at most 0.6 mg/L of NaCl, categorizing it as pure freshwater since its salt concentration is below 500 mg/L[8]. This low anion concentration is noteworthy, as it suggests minimal contamination from industrial or agricultural sources which typically increase anion levels in natural water bodies.

From an environmental perspective, the purity of Long-tan waterfall's water signifies effective ecological preservation and limited human impact. This purity could be beneficial for local biodiversity, supporting a wide range of aquatic and terrestrial species. Additionally, the presence of high silicon concentrations, akin to those found in Ping-Xiang and "The Longevity Village in Shandong," warrants further exploration. Silicon's potential health benefits, as observed in these regions, suggest that Long-tan waterfall's water might also offer similar advantages, adding another layer of value to its ecological and public health significance.

3.3 Alkalinity

Both phenolphthalein alkalinity, bicarbonate alkalinity, and carbonate alkalinity are found to be below 10 mg/L. These low levels of alkalinity may originate from the natural decomposition of minerals in the soil or atmospheric influences [9]. This limited alkalinity is significant as it indicates minimal buffering capacity, which means the water in Long-tan waterfall is less capable of neutralizing acidic pollutants.

This characteristic could have both positive and negative implications. On one hand, the low alkalinity contributes to the overall purity of the water, making it more suitable for certain ecological habitats that thrive in less alkaline conditions. On the other hand, it also implies that the water is more vulnerable to acidic contamination, which could be a concern in the face of increasing environmental pressures and potential acid rain.

In conclusion, while the low alkalinity and anion concentration of Long-tan waterfall's water highlight its pristine nature and minimal human impact, these factors also suggest a need for careful monitoring and conservation strategies to maintain its quality. Future research should aim to balance ecological preservation with the benefits of local tourism, ensuring that this natural resource remains unspoiled for generations to come.

3.4 Conductivity

At 25˚C, the conductivity of the water at Long-tan waterfall is measured at 53 μS/cm. Conductivity in water is primarily influenced by the presence of inorganic dissolved solids such as chlorides, carbonates, alkalis, and sulfide compounds. When we compare this value to other natural water sources, such as snow water, which typically ranges from 2 to 40 μS/cm, we find that Long-tan waterfall's water is quite pure[10], indicating minimal contamination.

In summary, the low conductivity of Long-tan waterfall's water highlights its exceptional purity and minimal human impact, but also underscores the need for vigilant conservation efforts to sustain its pristine condition for both ecological health and potential public health benefits.

4.Conclusion

The study of Long-tan waterfall's water quality has revealed its exceptional purity and minimal human impact, as evidenced by its low alkalinity, anion concentration, and conductivity. These characteristics highlight the pristine nature of the water, which supports a diverse array of aquatic and terrestrial life forms that thrive in such environments. The low conductivity, in particular, suggests that the water is not heavily laden with dissolved salts and other contaminants, making it suitable for sensitive species that require pure water for their survival and reproduction.

To ensure the preservation of this natural resource, future research should focus on understanding the ecological dynamics within the Long-tan waterfall area. This includes studying how the pristine water conditions impact local biodiversity and exploring strategies to balance ecological preservation with the benefits of local tourism. By doing so, we can ensure that this natural treasure remains unspoiled for generations to come, sustaining its ecological health and potential public health benefits.

In summary, while the purity of Long-tan waterfall's water is a testament to its untouched nature, it also underscores the need for vigilant conservation efforts. Maintaining this delicate balance between human use and environmental protection will be crucial in preserving the unique qualities of this water source for the future.

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