

A Study of the Physicochemical Properties and Elemental Analysis in Chindwin River Water near Monywa

Thin Thin Hlaing ¹, Zin Mar Win ²

Abstract

Water is one of the most important compound to the ecosystem. Better quality of water described by its physical, chemical and biological characteristics. Due to increased human population, industrialization, use of fertilizers in agriculture and man-made activity. The natural aquatic resources are causing heavy and varied pollution in aquatic environment leading to water quality and depletion of aquatic biota. Therefore, quality drinking water is necessary to check regularly at time interval. In the present work, the Chindwin river water samples were collected from sampling site of Chindwin river near Monywa Township, Sagaing Region. Determination of some physicochemical properties (pH, Temperature, Total alkalinity, Total hardness, Total dissolved solids, Total suspended solids, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand, Chlorides) of river water samples were carried out by conventional methods. The contamination of heavy metals (Cr, Mn, Fe, Cu, Zn, Pb, Cd, Mg and Ca) of river water samples were determined by using AAS.

Keywords: Total alkalinity, Total hardness, Dissolved oxygen, Biochemical oxygen demand

Introduction

A river is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river. Rivers are part of the hydrological cycle. Water generally collects in a river from precipitation through a drainage basin from surface runoff and other sources such as groundwater recharge, springs and the release of stored water in natural ice and snowpacks. Rivers have been used as a source of water, for obtaining food, for transport, as a source of hydropower to drive machinery, for bathing and as a means of disposing of waste. They can provide a rich source of fish and other edible aquatic life and a major source of fresh water which can be used for drinking and irrigation. Rivers have been important in determining political boundaries and defending countries. The beautiful Chindwin and Ayeyarwady Rivers are at the heart of Myanmar life. The Chindwin River is a river in Myanmar and the largest tributary of the country's Chief river the Ayeyarwady. It flows entirely within Myanmar and is known as Ning-thi to the Manipuris. The river's course is generally southwesterly until the town of Mingin. It then takes a more southeasterly course entering into broad central plain, passing the city of Monywa on the left bank. Its course at this point forms the boundary between the Sagaing District of Sagaing Region and the Pakokku District of Magway Region. Chindwin river is very useful for people. People is used for, drinking water, obtaining food, transport, fishing, boating and construction.

Materials and Methods

Water samples were collected from Chindwin river near Monywa Township. The samples were collected in polyethylene bottles which had been washed with a detergent and rinsed with water, diluted nitric acid solution and distilled water. Sampling sites were recorded with GPS detector. The sampling sites were represented in Figure 1. All chemicals were used of analytical reagent grade. In all investigations, the recommended standard methods and techniques involving both conventional and modern methods were provided. Determination of Physicochemical properties of river water samples, such as pH, dissolved

¹Lecturer, Department of Chemistry, Dagon University

²M.Sc student, Department of Chemistry, Monywa University

oxygen and turbidity were measured by digital meter (HANNA instrument). Total suspended solids and total dissolved solids were determined by filtration and evaporation methods. Total hardness, total alkalinity and chemical oxygen demand were determined by titration method. Some element contents in river water samples were determined by Atomic Absorption Spectrophotometry (AAS).

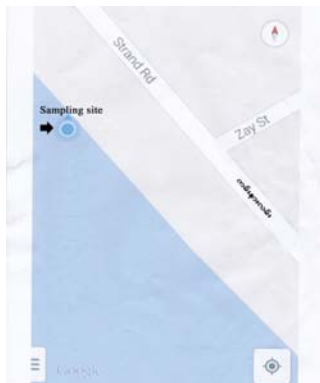


Figure (1). Satellite image of sampling site

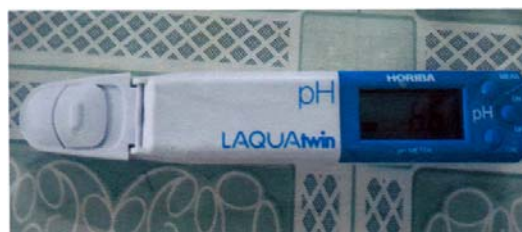


Figure (2). pH meter



Figure (3). Turbidity

Results and Discussion

Some Physicochemical Properties of River Water Samples

In the present study, river water samples were collected October (W_1) and December (W_2). The collected water samples were investigated by conventional methods as well as modern instrumental techniques. In this present work, pH value of water samples W_1 and W_2 were determined as 7.40 and 7.85 respectively. The observed values of pH were within the EPA guideline standards of pH 6.5 - 8.5 for aquatic life protection. The Chindwin river is slightly alkaline. The temperature values were recorded as 28.9 °C of sample W_1 and 28.4°C of sample W_2 respectively. The observed values of temperature were lower than EPA guideline standard of temperature 32°C. The turbidity values of water samples were recorded as 767 FTU of sample W_1 and 760 FTU of sample W_2 respectively. The observed values of turbidity were higher than EPA guideline standard. The total suspended solids of samples W_1 and W_2 were recorded as 113 ppm and 31 ppm respectively. The total suspended solids of

samples were lower than the EPA guideline standard. The total dissolved solids of samples W₁ and W₂ were recorded as 146 ppm and 84.4 ppm respectively. The observed values of total dissolved solids were lower than EPA guideline standard. The observed values of total hardness of samples W₁ and W₂ were found as 64 ppm and 72 ppm respectively. These values were lower than EPA standard range. The observed values of total alkalinity of water samples W₁ and W₂ were recorded as 220 ppm and 240 ppm respectively. The observed values were higher than EPA standard. The values of chlorinity of samples W₁ and W₂ were determined as 23.976 ppt and 24.975 ppt respectively. These observed values were lower than EPA standard. The value of dissolved oxygen in samples W₁ and W₂ were recorded as 7.3 ppm and 8.3 ppm. The observed values of dissolved oxygen were higher than EPA guideline standard. The values of biochemical oxygen demand in samples W₁ and W₂ were recorded as 1.25 ppm and 1.5 ppm. The observed values were within the allowable limit of EPA standards for aquatic life protection. The chemical oxygen demand values of samples W₁ and W₂ were detected as 3 ppm and 16 ppm respectively. From the results, sample W₁ was lower and W₂ was higher than the EPA standard. All of these data are shown in Table 1.

Table (1). Some Physicochemical Properties of Water Samples from Chindwin River near Monywa

Parameters	Observed Values of Samples		EPA guideline Standard
	(October) W ₁	(December) W ₂	
pH	7.40	7.85	6.5 - 8.5
Temperature (°C)	28.9	28.4	<32
Turbidity (FTU)	767	760	<700
TSS (ppm)	113	31	150
TDS (ppm)	146	84.4	500
Total hardness (ppm)	64	72	90 - 100
Total alkalinity (ppm)	220	240	30 - 150
Chloride (ppt)	23.976	24.975	250
DO (ppm)	7.3	8.3	4.0 - 5.0
BOD (ppm)	1.25	1.5	5.0
COD (ppm)	3	16	10

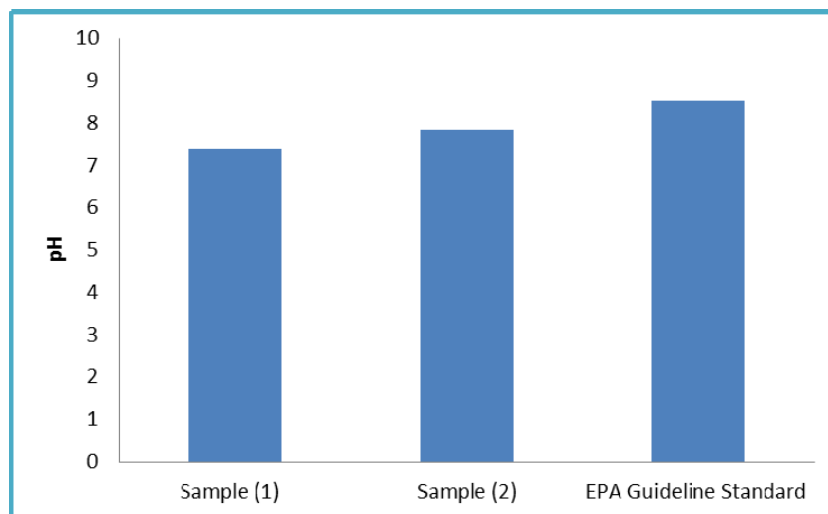


Figure (4). The comparison of pH of water samples and EPA guideline standard

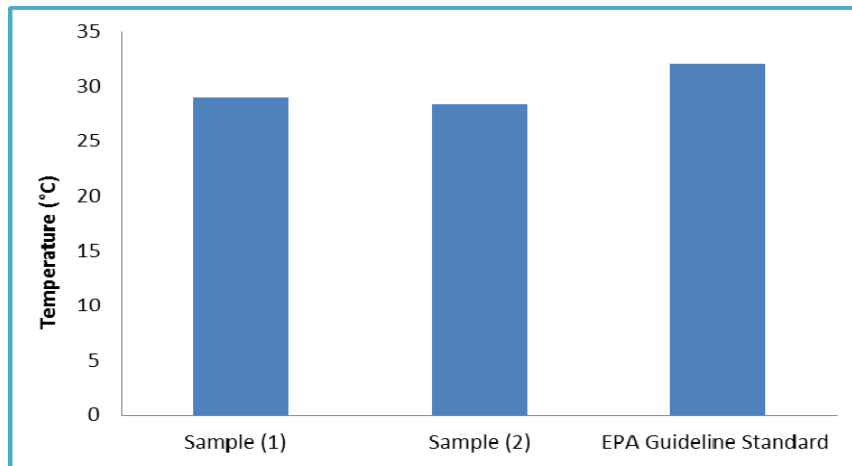


Figure (5). The comparison of temperature of river water samples and EPA guideline standard

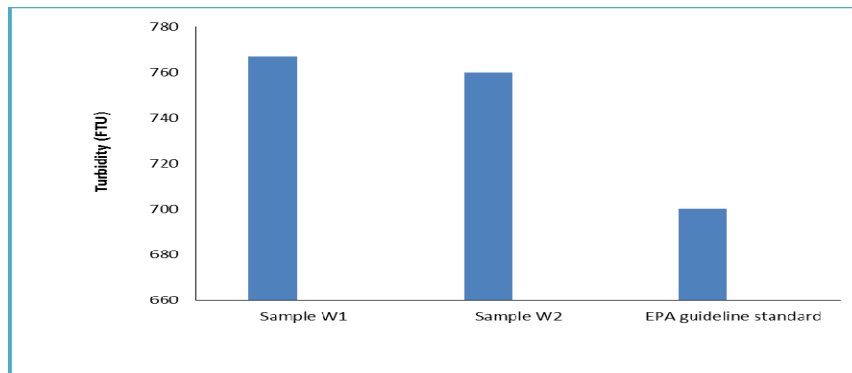


Figure (6). The comparison of turbidity of river water samples and EPA guideline standard

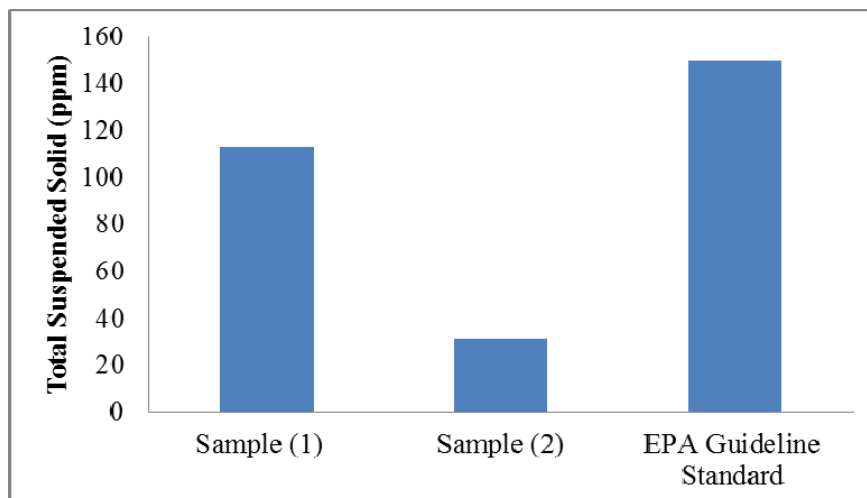


Figure (7). The comparison of total suspended solids of water samples and EPA guideline standard

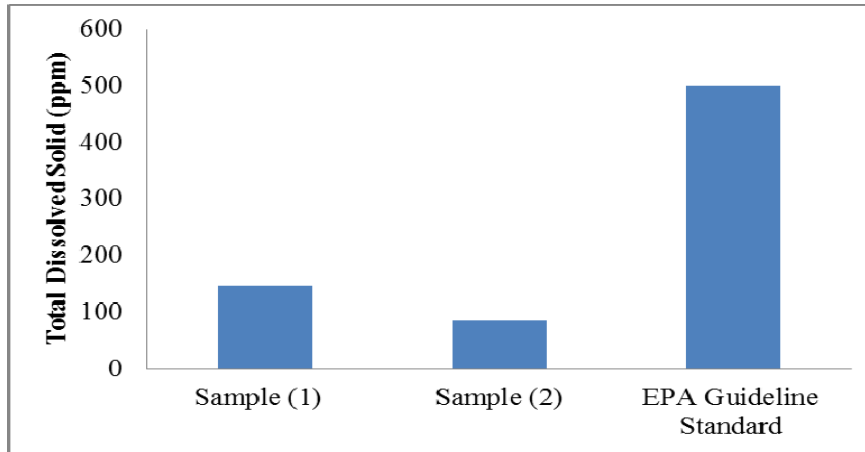


Figure (8). The comparison of total dissolved solids of water samples and EPA guideline standard

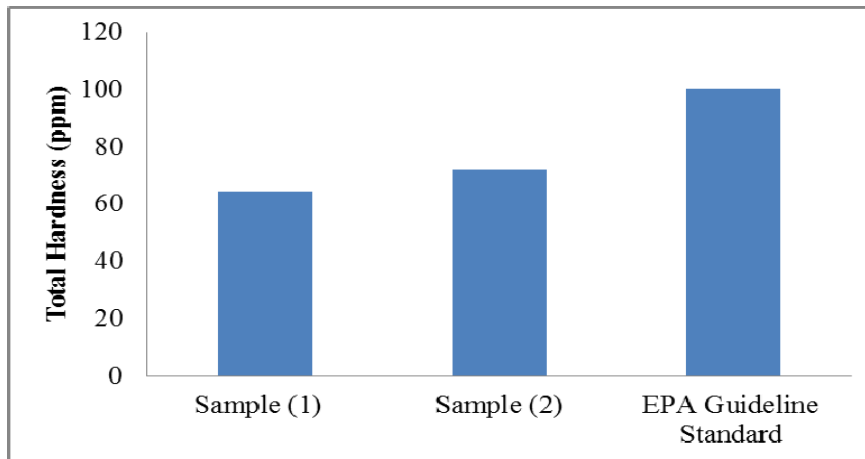


Figure (9). The comparison of total hardness of water samples and EPA guideline standard

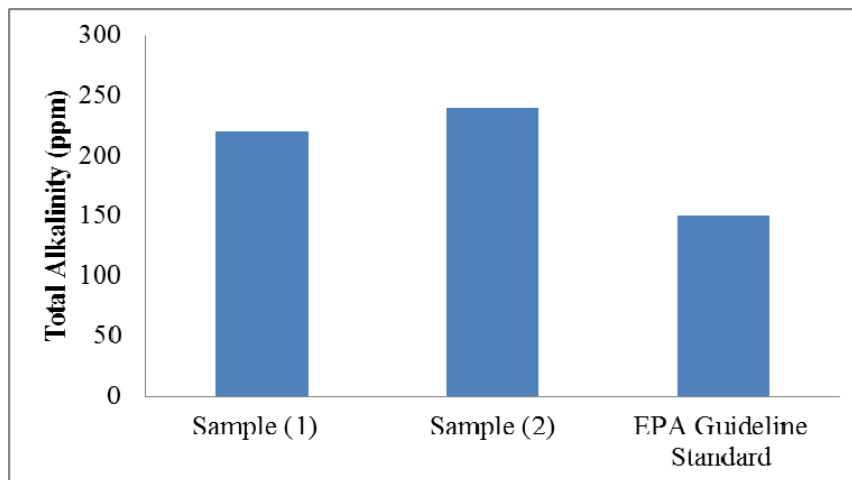


Figure (10). The comparison of total alkalinity of water samples and EPA guideline standard

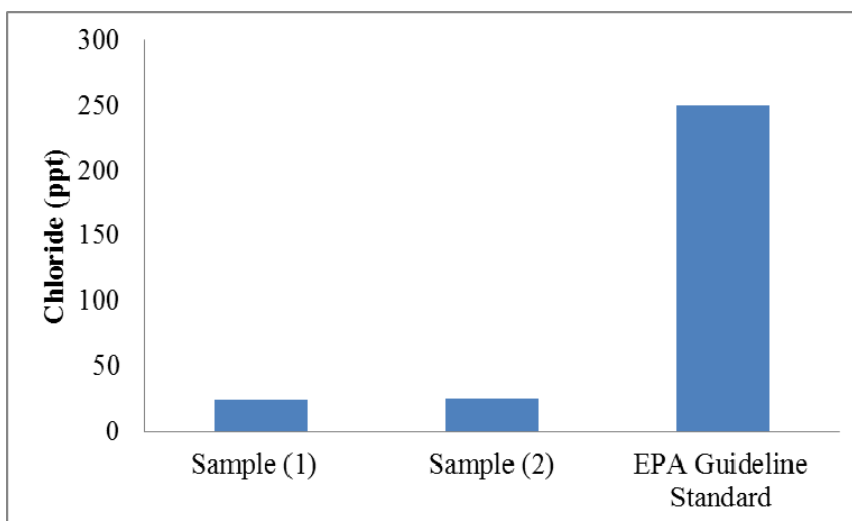


Figure (11). The comparison of chloride of water samples and EPA guideline standard

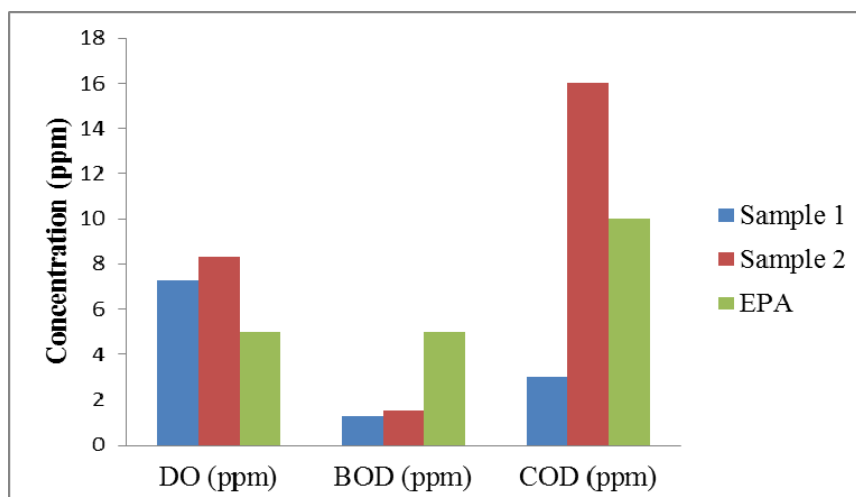


Figure (12). The comparison of some oxygen demanding substances of water samples and EPA guideline standards

Elemental Analysis of Some Elements in Chindwin River near Monywa

In this present work, iron was found as 0.498 ppm in sample W₁ but not found in sample W₂. Zinc was recorded as 0.045 ppm in sample W₁ but not found in sample W₂. Lead was found as 0.578 ppm and 0.588 ppm in samples W₁ and W₂ respectively. Cadmium was recorded as 0.034 ppm and 0.026 ppm in samples W₁ and W₂ respectively. Magnesium contents were recorded as 8.897 ppm and 7.979 ppm in samples W₁ and W₂ respectively. Calcium contents were recorded as 3.881 ppm and 0.769 ppm in samples W₁ and W₂ respectively. These results are presented in Table 2.

Table (2). Some Elements of Water Samples from Chindwin River near Monywa

No	Elements	Observed Values of Samples		EPA guideline Standard
		(October) W ₁	(December) W ₂	
1	Cr (ppm)	ND	ND	0.1
2	Mn (ppm)	ND	ND	0.4
3	Fe (ppm)	0.498	ND	0.3
4	Cu (ppm)	ND	ND	1.0
5	Zn (ppm)	0.045	ND	3
6	Pb (ppm)	0.578	0.588	0.05
7	Cd (ppm)	0.034	0.026	0.005
8	Mg (ppm)	8.897	7.979	50
9	Ca (ppm)	3.881	0.769	65

ND = Not Detected

Conclusion

The present study concerned Chindwin river water quality of Monywa Townships based on the physicochemical properties and analysis of some elements. Some physicochemical properties (pH, temperature, turbidity, TSS, TDS, total hardness, total alkalinity, chlorinity, DO, BOD, COD) and elemental analysis of some elements (Cr, Mn, Fe, Cu, Zn, Cd, Mg, Pb) of river water samples from sampling site of Chindwin river near Monywa were investigated by using conventional methods. The data were compared with acceptable level of EPA guideline standards. According to the results, the river water quality of some parameter did not change significantly in study period and almost of parameters were lower than the EPA standard values. So, the river water may be used for many purposes and for potable to need boil it.

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