iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 2 **Issue:** XII **Month of publication:** December 2014

DOI:

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Heavy Metals Pollution of Cherlapally Lake, Hyderabad. T.S, India

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Abstract- A study was conducted in the water samples collected from, Cherlapally fresh water Lake, Cherlapally village, Ranga Reddy district, Telagana state, India. The lake was constructed in the year 1970s, during that time the lake was the main source for drinking and agriculture purpose only. In the past 15 years sewage water from Kapra Village and Kushaiguda areas is entering the fresh water Cherlapally Lake. At the same time many industries like electrical and electronics, earth drilling equipment's, pharmaceuticals, printing packaging, metal fabrication industries, and bore wells rigs manufacturing companies have come up around the lake. Therefore there is a possibility for heavy metals carrying in to the Lake, for this purpose experiments was done in three sites of the Cherlapally Lake that are site-1 (in-let), site-2 (out-let), and site-3 (middle) for heavy metal pollution. The heavy metal concentrations reported in Lake during the rainy season, 2013: The results indicated that, Mg ranged from 1075.5 to 2209 mg/L, Co from 0.29 to 1.68 mg/L, Cd from 0.35 to 0.92mg/L, Zn from 2.74 to 26.4 mg/L, Mn from 3.22 to 9.22 mg/L, Ca from 2832 to 6318 mg/L, Cu from0.47 to 57.6, Fe (Iron) from 10.2 to 63.82 mg/L, Ni from 5.17 to 14.58 mg/L, K from 6.9 to 20.5mg/, As from 26.8 to 49.38 mg/L, Na from11.56 to 18.36mg/L. The following heavy metals were found to be in high concentrations above the maximum permissible limits prescribed by BIS and WHO water quality guidelines Arsenic, Cadmium, Copper, Nickel, Zinc, and Ferrous. Therefore the lake can be regarded as polluted lake.
Keywords: heavy metals, Cherlapally Lake, pollution status, water quality, Hyderabad

I. INTRODUCTION

The Experimental worksite is Cherlapally Lake located in Cherlapally village, Ranga Reddy District, Telangana, India. The household of the Cherlapally village is above 1064 and the population is above 4260.Earlier lake water was not polluted. The lake water was main source for drinking and agriculture purposes. Rice was the main crop grown from the water of Cherlapally Lake. For the lake 15 years the Cherlapally Lake is receiving sewage waste water from Kapra Village and Kushaiguda areas. In addition to this heavy metals releasing industries such as, electrical and electronics, metal fabrications, forgings and casting, printing and packing and bore wells rigs and earth drilling equipment industries have come up in the surroundings of the lake. Therefore there is possibility of water pollution and increase of heavy metal concentrations in the lake. Simantiniously population of the Cherlapally village also increased leading to further increase in pollution of the lake. Use of wastewater for irrigation may result in the accumulation of heavy metals sometimes to levels above the permissible limits for both animal and human health as specified by World Health Organization (WHO) standards [1]. Wastewater disposal is becoming a problem in developing countries as large quantities of municipal waste and industrial effluent are being produced due to increased urbanization and industrialization respectively Alloway& Ayres [2]. For this purpose experiments conducted to know the pollution status and water quality parameters in the Cherlapally Lake. The present study was carried out during the Aug 2013 to December 2013 to analyses heavy metal concentrations in Cherlapally Lake.

II. MATERIALS AND METHODS

The present study was carried out in Cherlapally Lake of Cherlapally village, Ranga Reddy District, Hyderabad, T.S, and India. All the heavy metal estimations were done as per the standard methods described in APHA (American Public Health Association), [3].

III. COLLECTION OF WATER SAMPLES

Water samples were collected from 3 sites of the lake that are in-let of the lake (site-1), out-let of the lake (site-2), middle of the lake (site-3), and analysed for various heavy metals. The outcome of the results was compared with BIS standards (Bureau of Indian Standards) to find out the actual pollution status of the Lake.

IV. ANALYSIS OF METALS

Preliminary digestion for metals: Digestion of the samples was done with HNO_3, Hcl: Measured volume of well mixed acid (HNO_3, HCI) digested sample was taken and preserved into a beaker. Placed the beaker on a hot plate and cautiously evaporated to less than 5ml, making sure that the sample did not boiled and that go dry, cooled and add 5ml conc.HNO_3. Covered the container with a watch glass and returned to the hot plate. Increased the temperature of hot plate, so that a gentle reflux action occurred. Continued heating and added additional acid as required until digestion was completed.

V. ESTIMATION OF METALS

The following heavy metals as cadmium, chromium, cobalt, lead, arsenic, zinc and other elements like calcium, copper, iron, magnesium, manganese, potassium, sodium were determined using atomic absorption spectrophotometer.

VI. RESULTS AND DISCURSIONS

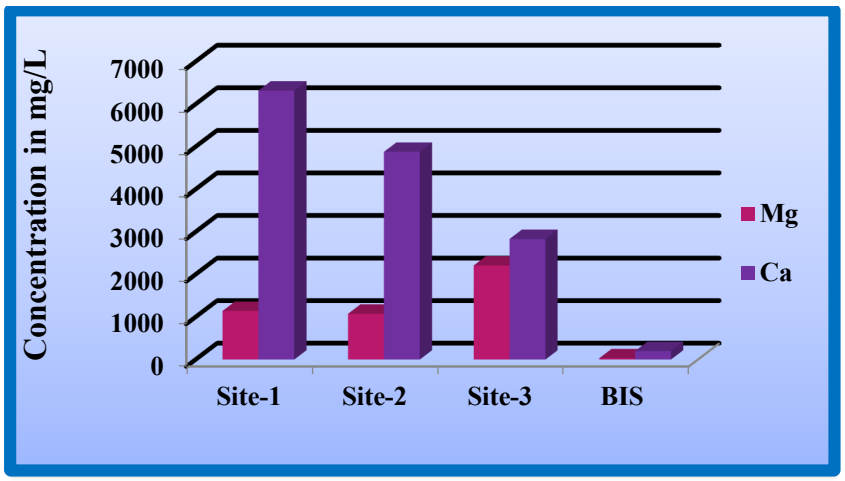

Figure. 1 Showing the Mg and Ca concentrations (mg/L) in sites (1to3) of the Cherlapally Lake during the rainy season-2013.

Magnesium concentration was observed from 1075.5 to2209 mg/L. Highest concentration 2209mg/L was observed in ste-3 of the lake and lowest concentration 1075 mg/L was observed in site-2 of the lake. The mg concentrations in all 3 sites were more than the prescribed limits of BIS guidelines.

Calcium concentration was observed from 2832 to 6318 mg/L. The highest concentration 6318 mg/L was observed in site-1 and lowest value 2832 mg/L was observed in site3 of the lake. Ca content was recorded maximum above the permissible limits of BIS standards in all three sites, shown in figure-1.

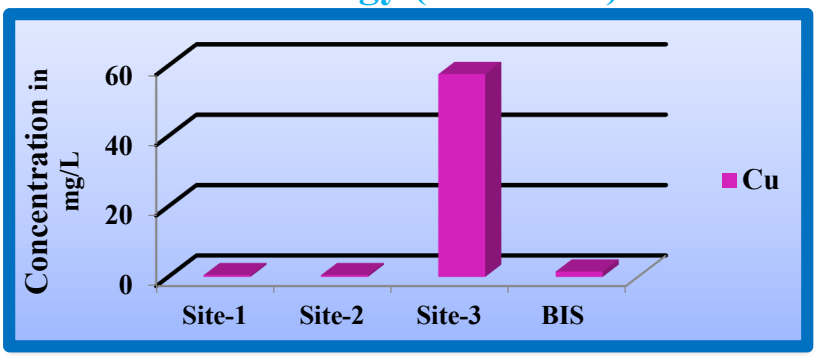

Figure.2 Showing the Cu concentration in three different sites of the Cherlapally Lake during the rainy season- 2013.

Copper concentration was recorded from 0.47 to 57.6 mg/L. Maximum concentration 57.6 mg/L was observed in site-3 of the lake and lowest concentration 0.47 mg/L was observed in site-1 of the lake. The concentration of the copper is very high in site-3 (middle) when compared to remaining sites. Similar values were recorded by E. A. Oluyemi et al., [4] and VA Jackson et al., [5]. Lower values founded by J.Akan et al., [6] , J.R. Turnland, [7], A.T.L.Gomez et al., [8] , S.A.Abbasi et al., [9] and O.N. Maitera et al., [10].

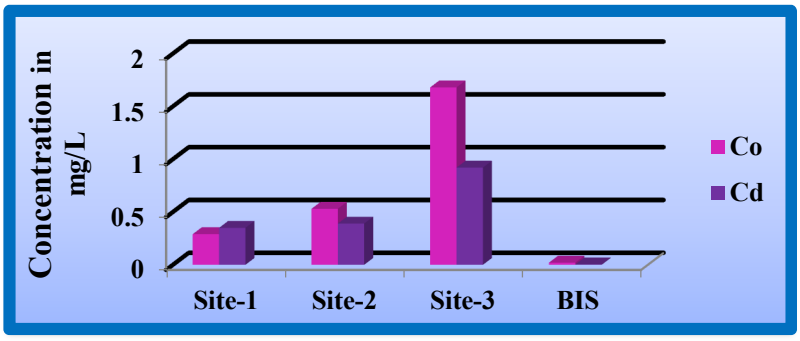

Figure. 3 Showing the Co and Cd concentration (mg/L) in three different sites (1to3) of the Cherlapally Lake during the rainy season-2013

Cobalt concentration was observed from 0.29 to 1.68 mg/L. The highest concentration 1.68 mg/L was observed in site-3 of the lake and lowest concentration value 0.29 was observed in site-1 of the lake. The Co concentration was in all 3 sites were more than the prescribed limits of BIS guidelines. Similar observations were founded by Joseph Clement Akan et al., [6].

Cadmium concentration was observed from 0.35 to 0.92 mg/L. The highest concentration 0.92 mg/L was observed in site-3 (middle) of the lake and lowest value 0.35 mg/L was observed in site-1 (out-let) of the lake. The Cadmium concentration was in all 3 sites were more than the prescribed limits of BIS guidelines, Shown in figure-3. Similar findings were observed by A. S. Adekunle et al., [4]. Lower values found by G. T. Chandrappa and H. Lokeshwari, [11] and O.N. Maitera et al., [10].

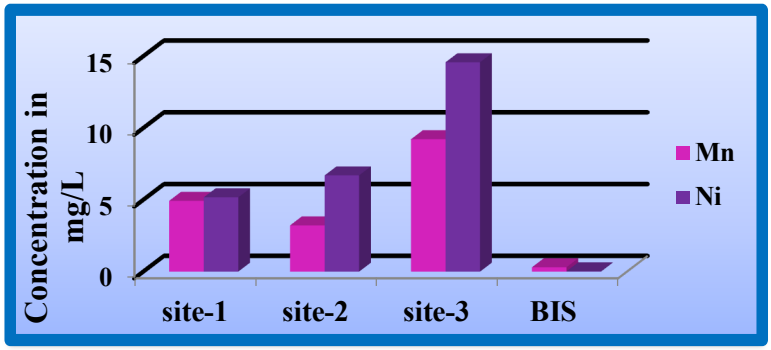

Figure. 4 Showing the Ni and Mn concentrations (mg/L) in sites (1to3) of the Cherlapally Lake during the rainy season-2013.

Manganese concentration was recorded from 3.22 to 9.22 mg/L. Maximum concentration 9.22 mg/L was observed in site-3 (middle) of the lake and minimum concentration 3.22 mg/L was observed in site-2 (out-let) of the lake. Mn was recorded concentrations in all the 3 sites of the Cherlapally Lake were more than the prescribed limits of BIS guidelines, shown in figure-4.Similar observation was founded by Mohammed Taha Abbagambo et al., [6] and Davies Onome Augustina et al., [12].

Nickel concentration was observed from 5.17 to 14.58 mg/L. Highest concentration 14.58 mg/L was observed insite-3 (middle) of the lake and lowest concentration5.17 mg/L was observed in site-1 (in-let) of the lake. Compared to BIS value the Nickel concentration is very high in all three sites, shown in figure-4.lower results were observed by Davies Onome Augustina et al., [12] and Abida Begum et al., [13].

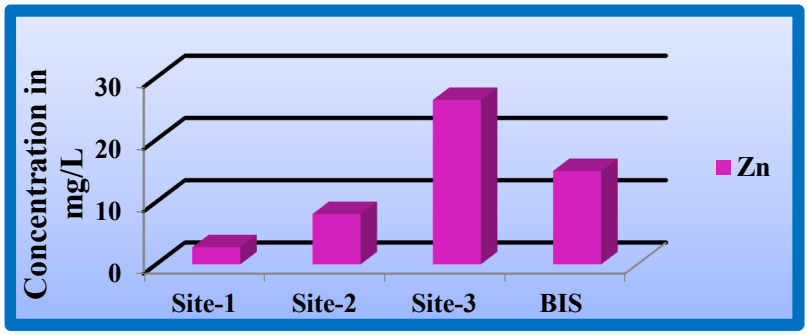

Figure. 5 Showing the Zn concentration (mg/L) in sites (1to3) of the Cherlapally Lake during the rainy season-2013.

Zn concentration ranged from 2.74 to 26.4 mg/L. Highest concentration 26.4 mg/L was observed in site-3 (middle) of the lake and lowest concentration 2.74 mg/L was observed in site-1 (in-let) of the lake. The concentration of the zinc was lower than the prescribed limits of BIS guidelines in site-1, site-2 and higher insite-3, shown in figure-5. Similar findings were observed by E. A. Oluyemi et al., [4] and Zaynab Muhammad Chellube et al., [6].

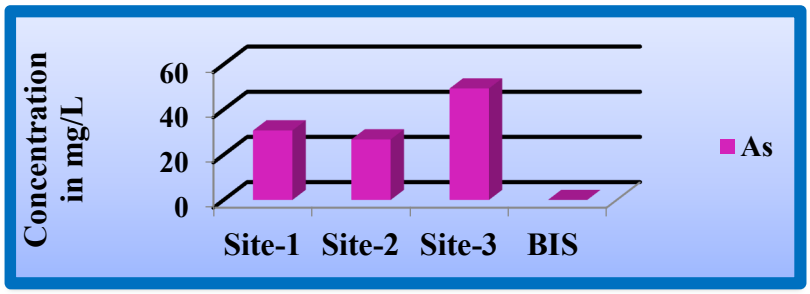

Figure. 6 Showing the Arsenic concentration (mg/L) in sites (1to3) of the Cherlapally Lake during the rainy season -2013

Arsenic concentration was observed from 26.8 to 49.38 mg/L. The highest concentration 49.38 mg/L was observed in site-3 (middle) of the lake and lowest concentration26.8 mg/L was observed in site-2 (out-let) of the lake. Arsenic concentration was in all three sites were more than the prescribed limits of BIS guidelines, shown in Figure-6. Lower values were observed by Christophe Kaki et al., [14].

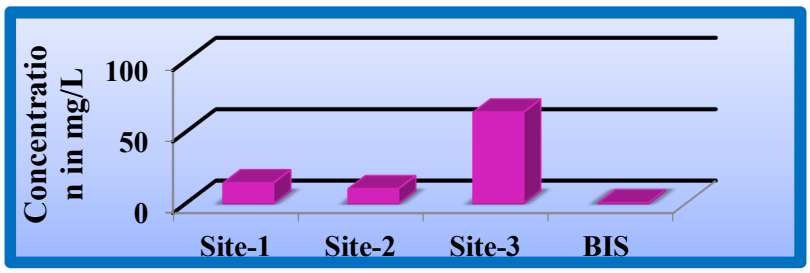

Figure.7 Showing the Fe concentration (mg/L) in sites (1to3) of the Cherlapally Lake during the rainy season-2013

Ferrous concentration was observed from 10.2 to 63.82mg/L. Highest concentration 63.82 mg/L was observed in site-3 (middle) of the lake and lowest concentration 10.2 mg/L was observed in site-2 (out-let) of the lake. Fe concentration was very high in all three sites when compared to BIS values, shown in figure-7.Similar findings were observed by A. A. Adenuga et al.,[4] , Fanna Inna Abdul rahman et al.,[6] and A N Paulse et al.,[5].

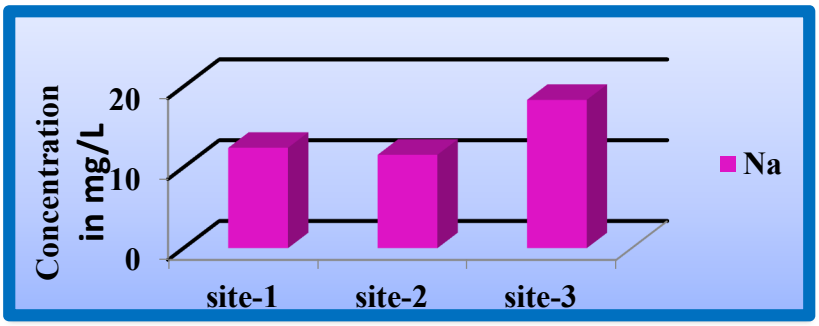

Figure.8 Showing the Na concentration (mg/L) in sites (1to3) of the Cherlapally Lake during the rainy season-2013

Na concentration was observed from 11.56 to 18.36 mg/L. Highest concentration 18.36 mg/L was observed in site-3 (middle) of the lake and lowest concentration 11.56 mg/L was observed in site-2 (out-let) of the lake, shown in figure-8.

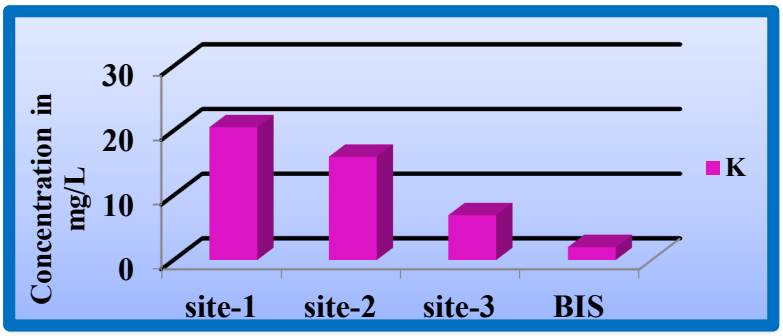

Figure. 9 Showing the K concentration (mg/L) in sites (1to3) of the Cherlapally Lake during the year sep-2013.

Potassium concentration was observed from 6.94 to 20.54mg/L. Highest concentration 20.54 mg/L was observed in site-1 (in-let) of the lake and lowest concentration 6.94 mg/L was observed in site-3 (middle) of the lake. K concentration was very high in all three sites when compare to BIS values, shown in figure-9.

Table 1 Showing Lead and Chromium results of three different sites (1to3) of the Cherlapally Lake during the year-2013.

	Lead	Chromium
site-1	BDL	BDL
site-2	BDL	BDL
site-3	BDL	BDL
BIS Limits	0.01	0.05

*Below Detectable Limit

VII. CONCLUSION

Concentrations of heavy metals were above the standards prescribed by World Health Organization (WHO) and Bureau of Indian

standards (BIS). Higher concentrations of heavy metal were observed like copper, cobalt, cadmium, manganese, nickel, zinc, arsenic, ferrous, sodium in site-3 when compared/ to site-2 and site-1 in Cherlapally lake water. Maximum concentrations of calcium, potassium were reported in site-1 when compared to site-2 and site-3 in Cherlapally lake water. The chromium and lead was present below toxic levels in all three sites. The following heavy metals were present in very high concentrations such as arsenic, zinc, ferrous, cadmium, nickel, copper when compared to BIS and WHO guidelines. This clearly indicates that once the fresh water Cherlapally Lake was polluted with heavy metals.

VIII. ACKNOWLEDGEMENT

I extend my special thanks to, UGC, New Delhi, for giving financial assistance RGNF No.F.14-2(ST)/2010 (SA-III) to me for giving research work.

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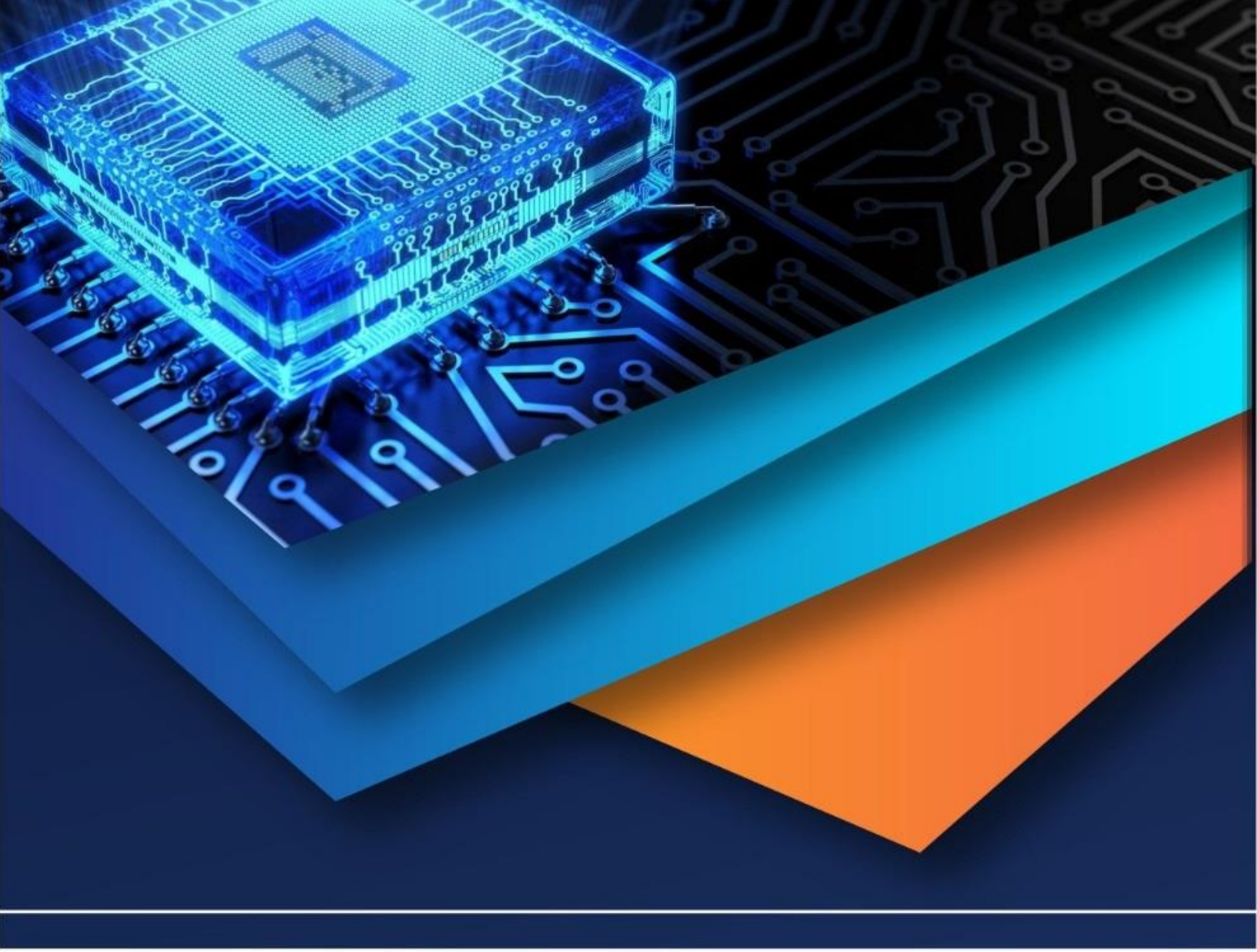

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