Evaluation of Physicochemical Parameters and Photochemical Degradation of Water from Hathed River (A Tributary of Narmada River) using TiO_2 Nanocatalyst

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Abstract - The present study water samples of Hathed River. A tributary of Narmada River in Narmadapuram Madhya Pradesh of India. Physico-chemical evaluation has been carried out from two stations to assess its suitability for drinking water domestic, irrigation and other purposes. The important parameters to be taken into consideration are determined in laboratory standard methods APHA. The parameters like temperature, pH, conductivity, TDS (Total Dissolve Solids), TH(Total Hardness), DO(Dissolve Oxygen), BOD(Biochemical Oxygen Demand), COD(Chemical Oxygen Demand) etc. were evaluated average of physical chemical parameters of water samples in the results of the Bureau of Indian Standard (BIS) values, which indicates water pollution of the river after that the parameters are out and the photochemical degradation of Samples by using TiO_2 Nanocatalyst reduced the level of pollution in the Sampled water of the River.

Key words **– Photochemical, Degradation, Nanocatalyst, TiO_2 (Titanium dioxide) etc.**

INTRODUCATION

Water is a precious and very important liquid forms of life on Earth. (nagasekaret al 2014) Rivers are a vital source of freshwater for life. Narmada river is the fifth largest, holy and most important river in India. It is commonly known as the life line of Madhya Pradesh. (Warhat et al.2006) It has many tributary rivers and Hathed river also one of is tributary. This tributary mainly flows in Narmadapuram. The Hathed river originates from Satpura hilly ranges near Golandoh at southeast 126°and 22°27’48”NL, 77°40’36” EL from Narmadapuram district of Madhya Pradesh. This river flows in the South to east direction to join the Narmada river from left banks and meets it near Anwalighat at East 79° and 22°28’34”NL, 77°29’27”EL in Narmadapuram district of Madhya Pradesh.

This river water used for bathing, drinking and agriculture purpose. The river water in Village is being polluted from several sources the discharge of sewage, domestic wastes effluents, washing of clothes, bathing of cattle, stream Bank cultivation. (Molovoka) River water pollution occurred when Pollutants are discharged directly or indirectly in to rivers. (government India 2021) River water pollution is one of the major environmental concerns today. Diminished river water quality upsets the balance of the aquatic ecosystem and leads to total consequences and both for human and animals. (Milo2007 and dalo 2008) Therefore river water quality determination using physicochemical parameters to enable comparison with relevant standard is necessary. (Li and zang2011) Due to all of this Hathed river affected temperature COD, BOD, DO, pH, TDS, colour and Total Hardness etc. Water pollution also carries and adverse impact on economic growth and social perspective socialism.

In this situation photo catalyst is good means removing of pollution. Water pollution wisdom photo catalyst is a past of improve Oxidation process pollution reduction and waste water treatment. Nanoparticles have great potential as water purification catalysts and redox active media due their large surface areas and their size and shape dependent optical, electronic and catalytic properties. (Obare & Meyer, 2004) During the last Decade, titanium dioxide (TiO_2) nanoparticles Have emerged as promising photo catalysts for Water purification (Adesina, 2004). TiO_2 nanoparticles are very versatile, can serve as both oxidative and reductive catalysts for pollutants. The removal of total organic Carbon from waters contaminated with

organic Wastes was greatly enhanced by the addition of TiO_2 nanoparticles in the presence of ultraviolet Light. (Chitose et al., 2003)

The Hathed river focused due to natural process of pollutants effluents such as all waste. Therefore looking at the condition of the problem the present research study focuses of Hathed river water pollution. I collected the river water and different parameters physicochemical. l emerged after the parameters out the photo degradation of samples by using TiO_2 Nanocatalyst.

MATERIALS AND METHODS

Experimental areas

For the present study of assessment of Narmada River tributary of Hathed river water quality analysis. So, I visited this river saw the water of this river in the village is getting polluted from many sources like, discharge of swage, domestic wastes, bathing, washing clothes, bathing cattle, plastic waste, flowers, and fertilizers and pesticides used in cultivation on the river banks. I collected water samples from two station. Station-1 (Dolariya) and stetion-2 (Anwalighat).

Samples collection

I took plastic bottles of 2L volume and thoroughly washed them nitric acid and rinsed with distilled water were several times. sample water was collected into these bottles and analysed in the laboratory of the department of chemistry Govt. NMV college Narmadapuram. The samples were a analysed on parameters carried out as per the standard methods (APHA 1989).

We can analyse by different parameters which are shown as below :-.

Table – 1

S.N.	Parameters	Method	Instrument used
1	Temperature	Thermometric	Thermometer
2	PH	Electrometric	Digital pH meter
3	Conductivity	Electrometric	Conductivity cell
4	TH (Total Hardness)	Titration with EDTA	Burette, pipette and glassware
5	TDS (Total Dissolve solids)	Gravimetric and conductivity	Conductivity cell
6	DO (Dissolved Oxygen)	Titrimetric wrinkle's method	Burette, pipette and glassware
7	BOD (Biochemical oxygen Demand)	Titrimetric Direct method	Burette, pipette, glassware and BOD machine
8	COD (Chemical Oxygen Demand)	Potassium dichromate reflex digestion	Burette, pipette glassware and COD digester machine

EXPERIMENT

For photo degradation we use photocatalytic reactor. This reactor is made up with a High quality glass double wall breaker. It joined with breaker and magnetic stirrer on hot plate instrument. The beaker is irradiate by UV lamp. Lamp is situated perpendicular above beaker. The radiation source is UV lamp.

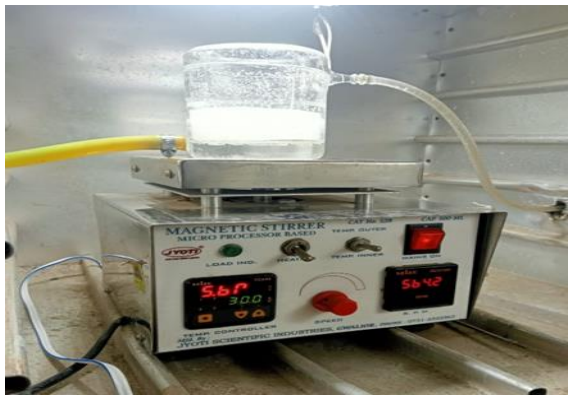
PROCEDURE

For the degradation experiments, in a photo catalytic reactor we take sample water and Nanocatalyst TiO_2. The suspension was subjected to irradiation under UV light for a fixed time. When the suspension has been stirred well than we take water parameters like pH, temperature, conductivity, Total Hardness TDS, and COD etc. By the digital machine and volumetric titration method. Before degradation the values decrease these parameters.

PHOTOCATALYTIC SET UP

In this take 60ml water sample quantity 0.5gm TiO_2 nanoparticle this is degraded on photo rector on 30 °C temp. For 3 hours of degradation cooling down water sample, determine these parameters.

DIAGRAM



Diag. - Photodegradation process

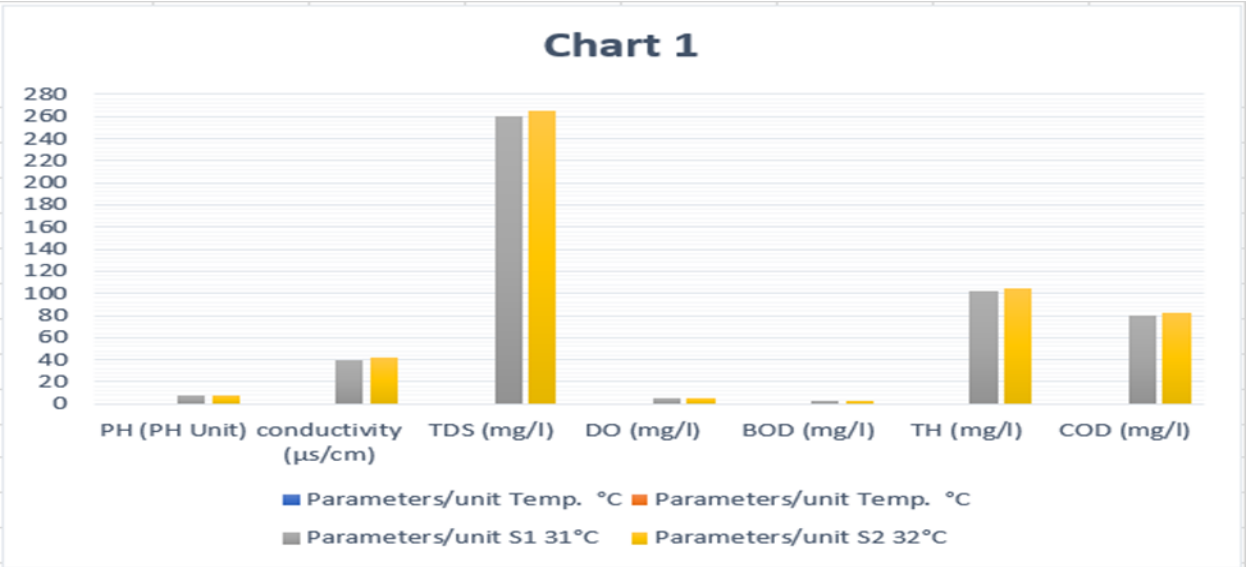
Table – 2 physicochemical parameters analysis of Hathed River water quality Before photodegradation by using TiO_2 Nanocatalyst

S.N.	Parameters/unit	Refrence value river water		Observed value the samples Before photodegradation	
		min.	max.	S1	S2
1	Temp. °C	25°C	30°C	31°C	32°C
2	PH (PH Unit)	6.5	8.5	8.2	8.3
3	conductivity (µs/cm)	0	200	40.0	42.0
4	TDS (mg/l)	200	500	260.0	265.0
5	DO (mg/l)	6.0	8.0	5.7	5.4
6	BOD (mg/l)	2.0	3.0	3.0	3.2
7	TH (mg/l)	120	200	102.0	104.0
8	COD (mg/l)	20.0	50.0	80.0	83.0

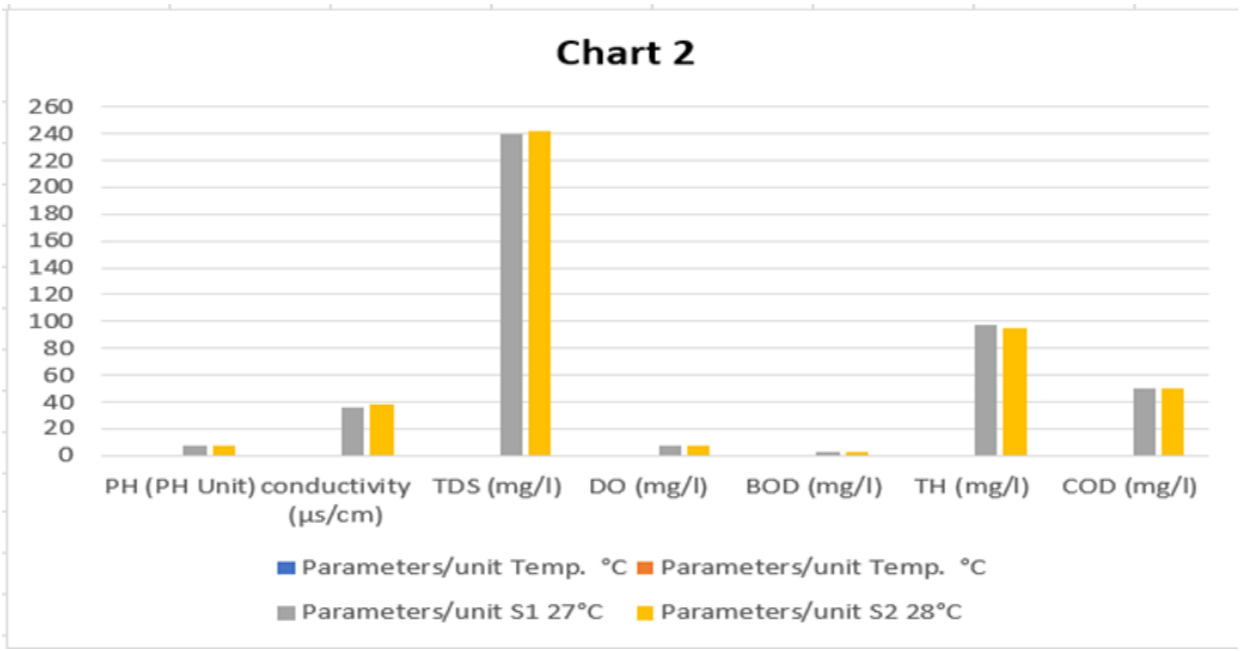
Table – 3 physicochemical parameters analysis of Hathed River water quality After photodegradation by using TiO_2 Nanocatalyst

S.N.	Parameters/unit	Refrence value river water		Observed value the samples After photodegradation	
		min.	max.	S1	S2
1	Temp. °C	25°C	30°C	27°C	28°C
2	PH (PH Unit)	6.5	8.5	7.2	7.5
3	conductivity (µs/cm)	0	200	36.2	38.4
4	TDS (mg/l)	200	500	240	242
5	DO (mg/l)	6.0	8.0	7.1	7.2
6	BOD (mg/l)	2.0	3.0	2.2	2.5
7	TH (mg/l)	120	200	97	95.3
8	COD (mg/l)	20.0	50.0	50	50.3

RESULT AND DISCUSSION



The results of the Hathed River water quality Before photodegradation by using TiO_2 Nanocatalyst



The results of the Hathed River water quality after photodegradation by using TiO_2 Nanocatalyst

The analytical results for the Hathed river water samples are before photodegradation shown in Table–2. pH(S_1-8.2 and S_2-8.3) values the sampled water varied slightly alkaline. After photodegradation using TiO_2 Nanocatalyst shown in Table-3 pH values (S_1-7.2 and S_2-7.5) minimise the values. Table-2, DO values (S_1-5.7 and S_2-5.4) and Table-3 increase the DO values (S_1-7.1 and S_2-7.2) after photodegradation. COD values of Table-2 (S_1-80.0 and S_2-83.0) and Table-3 shown in after photodegradation decrease the COD values (S_1- 50.0 and S_2 50.3 values).

CONCLUSION

From above experiment clear that river gets polluted water and decrease dissolved oxygen (DO) and increase COD in water bodies. The value of COD is minimizing by photo degradation by using TiO_2 Nano catalyst. Parameters such as the pH, temperature, conductivity, TDS, BOD, and COD etc. Decrease value and DO level increase for Nano Photocatalyst. TiO_2 is very active nanoparticle. In this experimental work, the effectiveness of using TiO_2 nanoparticles by photocatalysis in minimizing the samples water parameters of Hathed river were measured to minimise these parameters like pH, temperature, Conductivity, TH, TDS, BOD and COD.

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