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ENVIRONMENTAL ASSESSMENT OF BENISAGAR DAM OF CHHATARPUR DISTRICT AND PHOTODEGRADATION OF DAM WATER BY NANOCATALYST

Priya Nagwanshi[1] and Dr. Mukesh Kumar Ahirwar[2]
1. **Research Scholar Chemistry Govt. P.G. College, Tikamgarh (M.P.)**
2. **Asst. Prof. Chemistry Govt. P.G. College, Tikamgarh (M.P.)**

ABSTRACT:- In this research paper deals with work discussing about photo-degradation of Benisagar dam water by nano catalyst. Benisagar dam is situated with Longitudes and Latitudes of 24°6' and 25°20' on North 78°59' to 80°26' on East respectively with approximate182 meter above mean sea level experiencing an annual rain fall of 975-1150 m.m. Average temperature in cold 6-9 °C, summer 45-47° C, and rain 28-37°C. Banisagar dam is the most important dam of Chhatarpur district; besides being a source of water for irrigation and also the water of this dam used for artificial breading of Major Carp in the Chinese Hatchery is located here and area of the dam 380 hectare. Hence the present investigations and plane of work is consisting to observe the chemical and physical constituents of Benisagar dam water flow. The quality of water with the view to being out a transparence image of the water pollution status of dam and assessment of its effect and bringing forth suggestion for improvement. Through study is to be carried out. The sample collection, preservation and pretreatment will be according to standard method of collecting samples at international level *i.e.* APHA and WHO procedure. Prior to this a through survey will be conducted to know about probable pollution source and other relevant features. Photocatalytic water treatment by nano catalyst is a hot topic for pollutant degradation. ZnO has a unique property for above work because it has band gap 3.2(eV) and band gap wavelength (nm) is 387, low operating cost, simple morphology design, nontoxic and have a band gap energy.

KEYWORD:- Environmental Assessment, Photo degradation, Nanocatalyst and Benisagar Dam.

INTRODUCTION:-

Water is the very common liquid on our plant, which provides all of the vital activities to all of the life forms; water is a dispersion medium for all of the biochemical reactions of the living organisms and takes part in many of these reactions. Inspire of the chemical simplicity of the water molecules, its physical properties are quite remarkable, one might say wired and have been a major research topic for many year.

Even without human activity to pollute a lake or a reservoir and river, water would never be absolutely pure becomes of natural pollution or better say aging brought about the form of soil erosion, deposition of leaves and animal wastes. Over a long stretch of time, a water body can have a natural with as a consequence of such pollution of aging. The natural process of eutrophication or enrichment slowly them a reservoir into waste – water SMK. Man's activity however, enormously speeds up this process.

Fresh water is a critical, finite, vulnerable, renewable natural resource on the earth, and plays an important role in our living environment, without it, life is impossible. Since the beginning of the industrial revolution, increasing human population, economic activities as well as shortcomings in their management have resulted in more pollutants being introduced into watercourses. An increasing number of surface water bodies have come under serious threat of degradation. The global freshwater resources are under increasing pressure (GWP Technical Advisory Committee, 2000). The anthropogenic impact on aquatic ecosystems has become a crucial topic of increasing concern. These problems have led to the adoption of an integrated approach to the

management of water resources, which is called Integrated Water Resources Management (IWRM).
The water quality in ponds, rivers and streams may vary depending on the geological morphology, vegetation and land use (modification by human activities such as agriculture, industrialization and urbanization) in the catchment. Industries, agriculture and urban settlements produce nutrients (sewage effluent and fertilizers) and toxic substances, such as organic and inorganic pollutants, and other chemicals including heavy metals. Water pollution occurs when these substances, which degrade the water quality of river, enter the waterway and alter their natural function (Water and Rivers Commission, 1997). Where ponds and lakes have been profoundly altered and have lost much of their value, the scientific understanding of these water bodies is being used in prescribing restoration methods.

In this research work about photo-degradation of dam water by nano catalyst. Photo-degradation is the process of alteration of materials by light, refers to the combined action of light and air. It is usually oxidation and hydrolysis. Nano Catalyst is used for water purification. In this work we are going to discuss about water purification of Benisagar dam of Chhatarpur District.

REVIEW OF LITERATURE:-

Situmeang, et. al. (2021) "Preparation of Hollow Nanostructures via Various Methods and Their Applications." author represented, the hollow nanomaterial is a unique material to be developed because of its characteristics, especially the surface area where it has more surfaces than other materials. In general, hollow nanomaterials could be synthesized using hard-templated, soft-templated, self-templated, template-free and simple methods. In this chance, the catalyst preparation focused on using a simple method to study its activity on the dyes photodegradation reaction, deNOx reaction, carbon dioxides utilization, and photoconversion of chemical compounds. The characterization is emphasized on Scanning electron and Transmission electron Microscopes were used to identify its structure and characteristics. Furthermore, the analysis of UV-Vis spectrophotometer and HPLC is done to point out its activity on the photodegradation of dyes, deNOx reaction, and photoconversion of cellulose and carbon dioxides utilization.

Wang, et. al. (2020) "Mechanism Insight into enhanced photodegradation of pharmaceuticals and personal care products in natural water matrix over crystalline graphitic carbon nitrides." In this research work author represented, pharmaceuticals and personal care products (PPCPs), an emerging class of highly recalcitrant water contaminants, have raised considerable concerns in environment community. Graphitic carbon nitride (CN) has shown a great potential towards the photodegradation of water contaminants under visible light irradiation. However, the conventional bulk CN (BCN) presents the amorphous structure, resulting in an inefficient yield of hydroxyl radicals (•OH) for the complete mineralization of PPCPs. This study provides fundamental insights into significantly enhancing the hydroxyl radical generation via improving the crystallinity of the pristine CN materials. Experimental measurements and accompanying density functional theory (DFT) computational analysis suggest that the crystalline carbon nitride (CCN) exhibited enhanced adsorption ability towards the dissolved O_2. Upon the light irradiation, the adsorbed O_2 molecules readily undergo a direct two-electron reduction reaction on the CCN surface, instead of the conventional two successive single-electron reduction reactions on the BCN surface, to produce H_2O_2 subsequently converting into •OH radicals. Along with the improved charge separation efficiency and electron transfer ability, CCN-based materials show superior photocatalytic activity towards PPCPs-type pollutants, compared with the pristine BCN catalysts. Importantly, the catalyst show excellent photo degradation activities under natural sunlight irradiation, at low PPCPs concentration (20 μg/L), in the mixed PPCPs solution or in the real wastewater/water samples, indicating the potential of CCN to enable practical ex situ destructive treatment of PPCPs-contaminated groundwater.

Nguyen, Van-Huy, et. al.(2020), "Tailored photocatalysts and revealed reaction pathways for photodegradation of polycyclic aromatic hydrocarbons (PAHs) in water, soil and other sources." In this research work author represented, Polycyclic aromatic hydrocarbons (PAHs), which are in the class of persistent organic pollutants, are considered as hazardous pollutants. To date, these compounds were detected globally in soil, sludge, water, and other

contamination sources. A variety of treatment methods have been used in recent years to degrade PAHs in the environment. Photocatalysis, among advanced techniques, is proposed as the most effective method for the treatment of PAHs.

Zyoud, Ahed H., et. al. (2019) "Kaolin-supported ZnO nanoparticle catalysts in self-sensitized tetracycline photodegradation: Zero-point charge and pH effects." In this research work author represented, natural waters are prone to pollution with organic contaminants, waste pharmaceuticals being an example. Pharmaceutical compounds are widely detected in different surface waters, such as lakes and rivers. Removal of such contaminants from water is therefore imperative. Different strategies are commonly followed such as adsorption, chlorination, ozonation, peroxidation and others. Each method has its shortcomings. Photodegradation of water organic contaminants by semiconductors is a safe and non-costly method. In photodegradation, the organic contaminant is completely mineralized with radiation and oxygen using stable semiconductor nanoparticles as photocatalysts. ZnO nanopowder is widely described for photo degradation processes.

Bianchi, Claudia L., et. al., (2018), "Micro-sized TiO_2 as photoactive catalyst coated on industrial porcelain gores tiles to photodegrade drugs in water." In this research work represented, Pharmaceutical compounds and their metabolites raise worrying questions because of their continuous release and lack of efficient removal by conventional wastewater treatments; therefore, they are being detected in groundwater, surface water and drinking water in increasing concentrations.

Barhariya R. et. al. (2023), "Study of photocatalytic removal of imidaclopride from water by advanced oxidation process with respect to Nanotechnology of Shakkar & Pench River of Chhindwara District (M.P.)".

OBJECTIVES:-

The main objective of photo degradation of water of Benisagar dam of Chhatarpur district. In this research discussed photocatalytic degradation of organic pollutants is promising technology due to its advantage of degradation on pollutants instead of their transformation under ambient conditions. The process is capable of removing a wide range of organic pollutants such as pesticides, herbicides, and micro-pollutants such as endocrine disrupting compounds. The effect of variables is required to be further studied in real water matrix to achieve representative results. The results achieved can be used to optimize the process and design appropriate reactor for potential large scale applications. The use of solar radiation has to be improved by virtue of the design of the photo reactor in order to reduce the cost of treatment. Further research to investigate the degradation of the real water constituents is required to better comprehend the process applications.

All the above mentioned studies showed that the effects of pollution in dam water serve and hence these lentic components need to be hydro-biological monitored. It is evident that dam ecology and its monitoring are of great environmental problems and should be taken up in a systematic approach.

MATERIAL AND METHOD:-

The Benisagar dam has been surveyed throughout the year, over a distance of about four sampling sites were selected. Here many people take bath and wash their cloths daily and also where continuous discharge of domestic sewage of the city is going on. The various physico chemical and biological parameters were determined as per methods suggested by APHA. Temperature, pH and dissolve oxygen were recorded immediately after collection of samples at the sites, while other parameters were analyzed in laboratory within 24 hours samples for the planktons were collected simultaneously and sedimentations were made in glass jars, after adding 10 ml of acid Lysol's solution for preservation. After 24 hours, the supernatant was discharged then remaining 25 ml of sediments was taken on glass slide and plankton's number counted under the microscope. Their estimation was made by drop method (Wong et.al. 2014 and Frimmel et.al., 2010).

For the ecological investigations the methods prescribed by Trivedi et.al. (1984) would be considerable. The plans for our study were similar to a previous study done by Metzling, L., Chessman, B., Hardwick, R., and Wong, V. (2003). The data collected during the study

would be analyzed by standard statistical methods prescribed by Welch (1951).

Nanoparticles

The fundamentals of nanotechnology are that the properties of substances change significantly when their size is reduced to the nanometer range. When a bulk material is divided into small particles in one are more dimensions in the nanometer range or even smaller, the individual particles show unexpected properties that are completely different from those of the bulk material. Bulk solids have continuous physical properties.

Ultrafine particles, nanoparticles are between 1 nm to 100 nm in size. The properties that distinguish nanoparticles from bulk material generally develop at a critical length of less than 100 nm. Nanoparticles may or may not have size related properties that are significantly different from those seen in fine particles or bulk solids.

ZnO nano catalyst

Nano materials are largely due to the large surface area of the materials, which dominates the contributions of the small mass of the material E. Roduner.

The distinguishing in energy between the conduction band and the valance band is called the band gap. ZnO haves valence band is 3, conduction band is -0.2, band gap 3.2(eV) and band gap wavelength (nm) is 387.

It is a white powder that is almost insoluble in water. ZnO semiconductor has several advantageous properties: Good transparency, high electron mobility, large band gap, strong luminescence at room temperature etc. Zinc oxide is non-toxic and skin compatible, making it a suitable additive for textiles and surfaces in contact with humans. It is also used as a catalyst for the synthesis of methanol. Increasing the surface area of zinc oxide at the nanoscale compared to larger powders.

RESULTS:-

The basic physical properties of mass and nano ZnO differ significantly; the study of the photo luminescent properties of ZnO confirmed that quantum confinement increases the energy of band the gap of ZnO. The change in band gap energy of ZnO nano particles also shows such size dependence. Improving surface conditions by making ZnO nanorods smaller is also well established (Tables 1 and 2).

TABLE 1. Physico chemical parameters at sampling sites in Benisagar Dam Chhatarpur (M.P.)

S. No.	Parameters	Site -A	Site -B	Site-C	Site-D	Site-E
1	pH	8.2	8.3	8.0	8.5	7.9
2	Conductivity	0.18	0.16	0.15	0.18	0.18
3	Alkalinity (mg/L)	161	164	162	180	172
4	Hardness (mg/L)	232	222	231	198	228
5	DO (mg/l)	6.4	5.9	6.2	6.1	6.4
6	BOD (mg/l)	4.8	4.6	4.5	4.7	4.1
7	COD (mg/L)	188	176	181	177	182
8	TDS (mg/L)	327	329	341	325	333
9	TSS (mg/L)	839	826	822	835	813
10	Chloride (mg/L)	374	372	366	379	375
11	Fluoride (mg/L)	0.6	0.6	0.5	0.6	0.5
12	Ca (mg/L)	276	268	271	273	274
13	Mg (mg/L)	19.23	18.60	18.21	19.11	19.33
14	SO_4 (mg/L)	16.21	16.11	16.22	16.51	16.31
15	NO_3 (mg/L)	28.16	28.21	28.01	29.01	28.65
16	Na (mg/L)	57.02	56.00	56.78	57.00	56.08
17	K (mg/L)	4.81	4.80	4.30	4.33	4.77
18	*E.coli* (CFU/100)	58000	57500	57800	58100	57600

TABLE 2. After photodegradation by ZnO nanocatalyst physico chemical parameters at sampling sites in Benisagar Dam.

S.No.	Parameters	Site I	Site II	Site III	Site IV	Site V
1	pH	7.1	7.2	7.0	7.5	7.1
2	Conductivity	0.12	0.13	0.12	0.11	0.12
3	Alkalinity (mg/L)	132	128	126	131	132
4	Hardness (mg/L)	203	196	201	203	204
5	DO (mg/l)	5.3	5.4	5.2	5.1	5.2
6	BOD (mg/l)	4.2	4.3	4.1	4.3	4.2
7	COD (mg/L)	161	156	158	160	162
8	TDS (mg/L)	368	358	362	361	357
9	TSS (mg/L)	745	712	743	702	729
10	Chloride (mg/L)	328	322	323	325	316
11	Fluoride (mg/L)	0.52	0.48	0.47	0.51	0.52
12	Ca (mg/L)	241	231	236	235	239
13	Mg (mg/L)	17.22	17.02	17.17	17.3	17.33
14	SO4 (mg/L)	14.12	14.21	14.20	14.31	13.80
15	NO3 (mg/L)	10.48	10.22	10.11	10.52	10.34
16	Na (mg/L)	52.32	52.01	51.55	52.02	52.55
17	K (mg/L)	4.10	4.20	4.30	4.02	4.00
18	*E.coli* (CFU/100)	21400	20200	21200	21100	23100

OBSERVATIONS :-

The survey of the dam water resources includes the identification and characterization of sites, which cause the pollution problems.

DISCUSSION :-

Several physico chemical and biological parameters and their variability have been studies in relation to the pollution of Benisagar dam water. The chemical analysis showed that polluted sites contained high values of chloride, total hardness, alkalinity, *E. coli* and *Coli* from count, but very low dissolve oxygen, which indicated a high pollution load.

CONCLUSION :-

Photocatalytic water treatment by nano catalyst is a hot topic for pollutant degradation. ZnO has a unique property for above work because it has band gap 3.2(eV) and band gap wavelength (nm) is 387, low operating cost, simple morphology design, nontoxic and have a band gap energy.

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