"REMOVAL OF NITRATE AND PHOSPHATR FROM EUTROPHIC LAKE WATER USING COMBINED ELECTRO-CHEMICAL COAGULATION"

Project Reference No : 47S_BE_2091

Name of the College : RNS INSTITUTE OF TECHNOLOGY

Branch : CIVIL ENGINEERING

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OBJECTIVES

The work has been taken with following objectives:

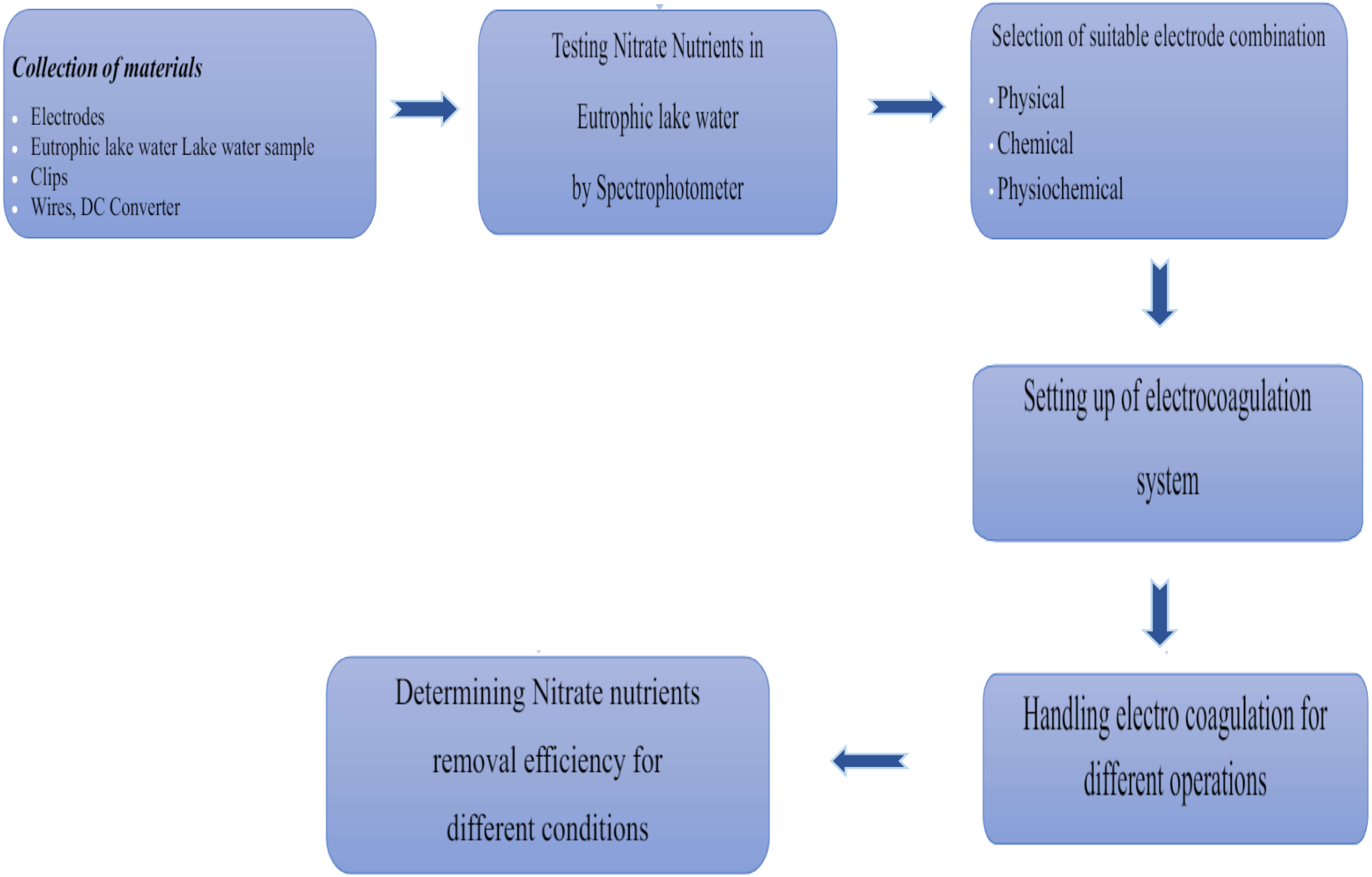
1. Assessment of potentiality of eutrophication invading water bodies leading to nutrient overloading and algal blooms.

2. Determination of Nitrate and Phosphate from the eutrophic lake water.

3. Selection of best suited electrode and its combination for removing Nitrate and Phosphate.

4. Determining the most efficient natural coagulant as an add on for improving overall removal Efficiency

METHODOLOGY



WORK PLAN

- Conduct a comprehensive literature review on electrochemical coagulation.
- Design the electro-coagulation components, including electrodes, power supply and coagulation chamber.
- Calibration of Spectrophotometer and preparation of standard nitrate solution for different trials.
- Experimental Trials for different combination of electrodes for constant 10V.
- Collect the sample from selected eutrophic lake and test pH and Initial Nitrate content using Spectrophotometer.
- By selecting most efficient electrode combination treat the lake water sample and check the final nitrate content in the lake water.
- Experimental trials on coagulation by using Ferric Chloride and Zinc Chloride.

SUMMARY OF PROGRESS (DESIGN, EXPERIMENTS, RESULTS) (Maximum 2 Slides)

EXPERIMENTAL TRIALS

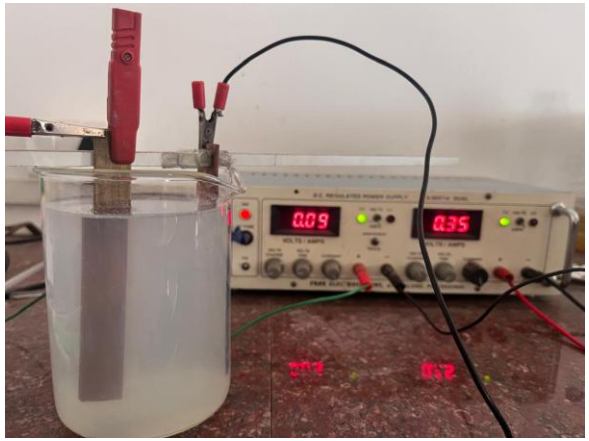
TRAIL-1

ELECTRODES USED: Combination Of Aluminium Electrodes

VOLTAGE: 10V

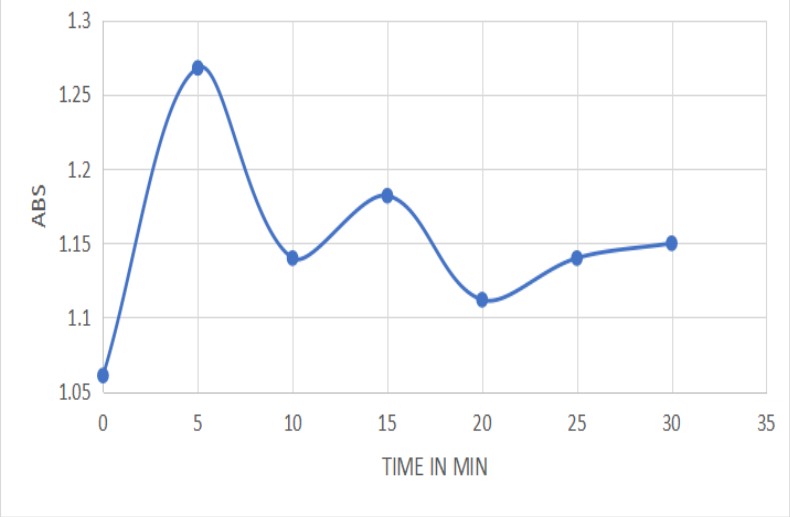
AMPERE: 0.05A

VOLUME OF SAMPLE: 800mL

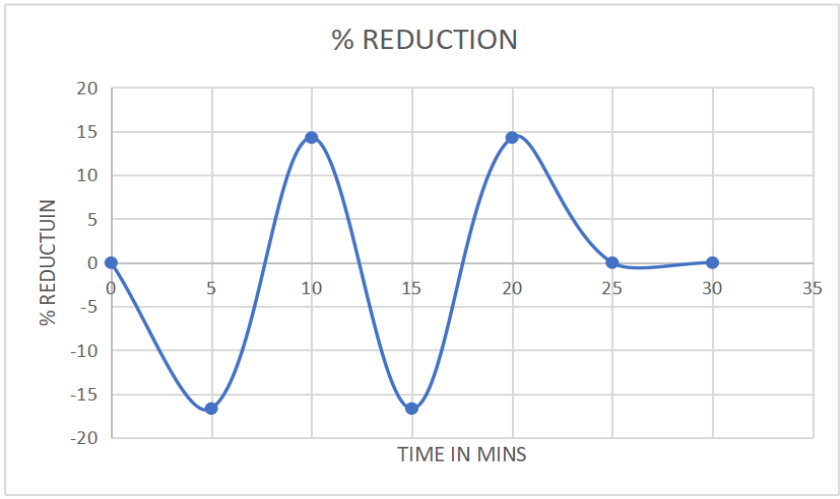


MIN	%T	NO_3(PPM)	ABS (%)	% REDUCTION
0	8.6	6	1.061	0
5	5.3	7	1.268	-16.66
10	7.2	6	1.14	14.28
15	6.5	7	1.182	-16.66
20	7.7	6	1.112	14.28
25	7.1	6	1.14	0
30	7	6	1.15	0

TABLE 1: ALUMINIUM ELECTRODE FOR 10V AND 0.05A



GRAPH 1 : CONCONCENTRATION v/s TIME



GRAPH 2 : PERCENTAGE REDUCTION GRAPH

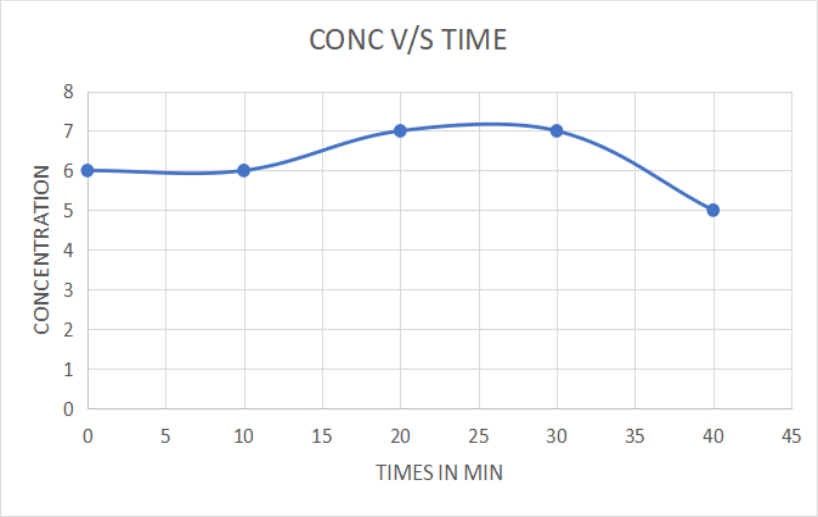
Discussion: Using the above table1 the graph 1 and 2 are plot. from the above graph 2 the nitrate content is increasing with respect to time. Using the above combination of aluminium electrodes nitrate content can increase due to the oxidation of nitrate ions in the electrolyte this is because when aluminium electrodes are used, they can release aluminium ions into the solution which can participate in various redox reaction including the oxidation of nitrate ions to form nitrogen oxides This can lead to an increase nitrate content in solution.

TRIAL-4

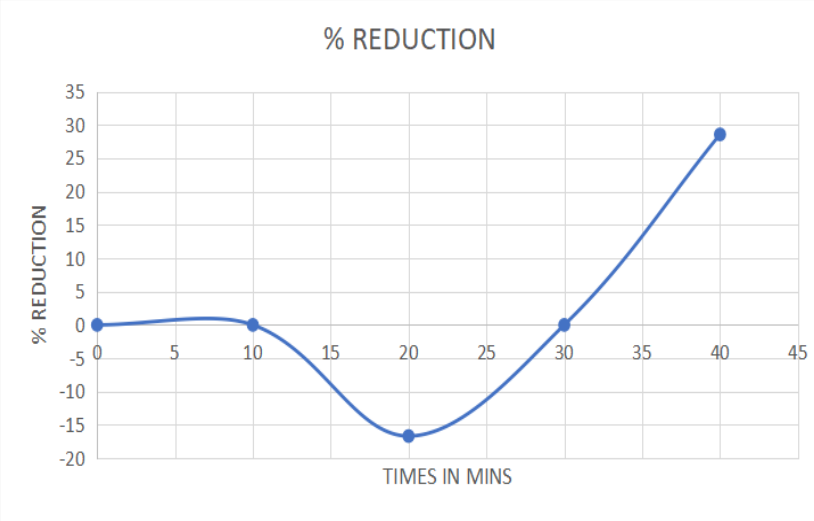
ELECTRODES USED: Combination Of Copper and Aluminium Electrodes
VOLTAGE: 10V
AMPERE: 0.8A
VOLUME OF SAMPLE: 800mL

MIN	ABS (%)	V	A	CONC (NO_3)	T%	% REDUCTION
0	1.027	10	0.8	6	9.3	0
10	1.158	10	0.8	6	7	0
20	1.188	10	0.8	7	5.7	-16.67
30	1.179	10	0.8	7	6.7	0
40	0.89	10	0.8	5	12.7	28.57

TABLE 5 : COMBINATION OF ALUMINIUM AND COPPER ELECTRODE FOR 10V AND 0.8AMP



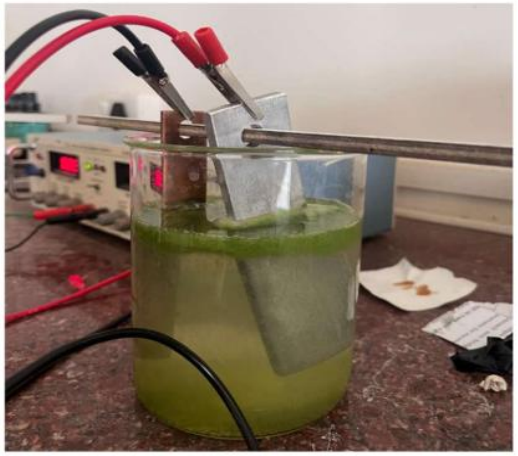
GRAPH 7 : CONCENTRATION v/s TIME



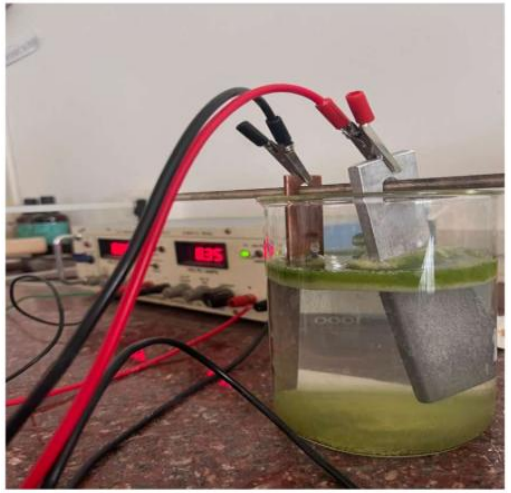
GRAPH 8 : PERCENTAGE REDUCTION GRAPH

Discussion: In electrolysis with copper and aluminium electrodes, the decrease in nitrate content occurs due to electrochemical reactions. Copper releases ions that reduce nitrate, while aluminium releases ions that can form complexes with nitrate, reducing its concentration in the solution.

TEST RESULTS FOR EUTROPHIC LAKE WATER



Eutrophic Lake water (Before Treatment)

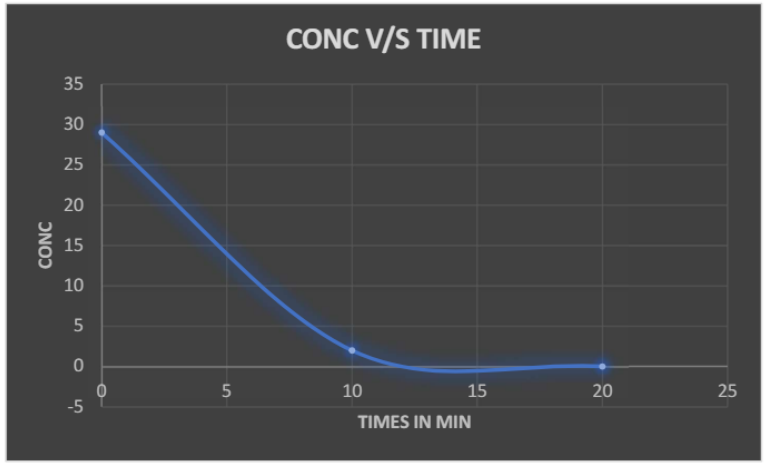


Eutrophic Lake water (After Treatment)

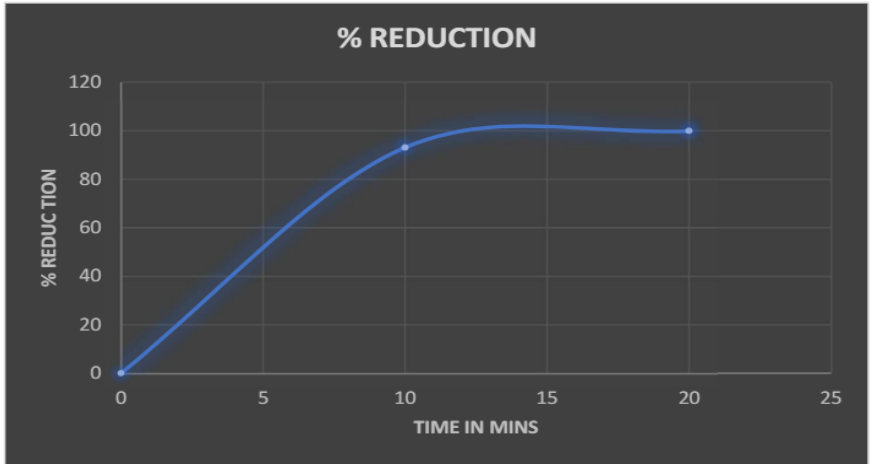
ELECTRODES USED: Combination Of Copper and Aluminium Electrodes
VOLTAGE: 10V
AMPERE: 0.8A
VOLUME OF SAMPLE: 800mL

OBSERVATION FOR TREATMENT OF EUTROPHIC LAKE WATER

TIME(MIN)	VOLTAGE(V)	AMP(A)	%T	ABS	CONC	% REDUCTION
0	10	0.36	20.4	0.69	29	-
10	10	0.36	112.1	0.05	2	93.1
20	10	0.36	194.9	-	-	100



CONCENTRATION V/S TIME



TIME V/S Percentage Reduction Graph

Initial (right) and Final (left) PH of Eutrophic Lake water

SCIENCE & TECHNOLOGY COMPONENT / INNOVATIVENESS / NOVELTY OF THE PROJECT
SCOPE FOR FURTHER DEVELOPMENT / PROTOTYPE DEVELOPMENT / INDUSTRIAL COLLABORATION / IPR SUPPORT

KSCST

- The removal of nitrate and phosphate from eutrophic lake water through electrochemical coagulation presents both opportunities and challenges. Eutrophication's ecological threats necessitate effective nutrient removal techniques, with electrochemical coagulation showing promise. However, scalability issues, including electrode design and power requirements, must be addressed for real-world application. Environmental considerations, such as byproduct formation and energy consumption, are crucial for minimizing adverse effects. The long-term sustainability of electrochemical coagulation relies on achieving meaningful ecological benefits while mitigating unintended harm to the ecosystem.