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Microbeads- Treatment on Waste Water

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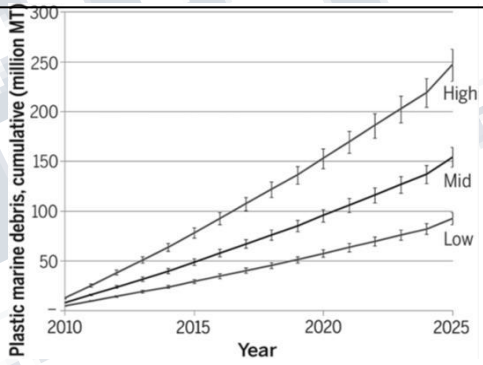
***Abstract*— Microbeads are solid plastic particles of less than five millimetres in their large dimension, which are frequently made of polyethylene but can be of other petrochemical plastics such as polypropylene and polystyrene. These microbeads are produced from exfoliating personal care products, toothpaste which is washed down the drain can pass unfiltered through the sewage treatment plants that makes their way into rivers and canals which result in plastic particle water pollution. These beads can absorb and concentrate pollutants on their surface, and thereby carry the pollutants. The study says that 5000-95000 microbeads are released into the environment with every single use of personal care product in which 35000 tons of micro plastic are from the cosmetic products. It constitutes 0.1-4% of the total plastic pollution. The rate 0.95 million tons per annum are dumped into the oceans which have a huge impact on the marine environment and to fisheries. In this paper, we try to understand the effectiveness of coagulation (Nano clay and moringa), Adsorption (activated carbon, Carbon nanotubes), Ion-Exchange (Nano clay and resins) and membrane filtration (Nano membranes) in the separation or removal of microbeads and to come with a technology for the treatment of microbeads contaminated water.**

***Index Terms*— Microbeads, Filtration, Degradation**

I. INTRODUCTION

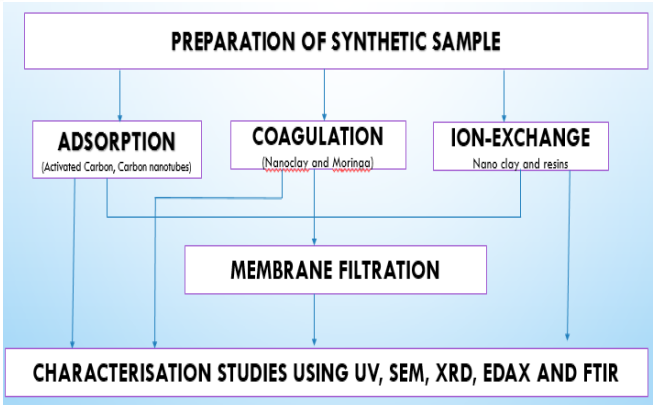
Microbeads are non-biodegradable plastics that can flow through the filtration system and end-up in plastic contamination. Ingested by marine life and causes environmental pollution and thus banned by Karnataka government. And in this paper we discuss on some methods for removing the micro-plastic contaminants using methods such as Adsorption, ion-exchange, Nano-membrane filtration.



II. BACKGROUND OF THE STUDY

- Micro plastic- 0.1-4% of the plastic pollution.
- Rate- 0.95 MT per annum deposited into oceans
- 35000 TONS of micro plastics from cosmetics are dumped –(Microbeads)
- Microbeads are washed down the drain, can pass unfiltered through the sewage treatment plants and make their way into rivers and canals, resulting in plastic particle water pollution. The beads can absorb and concentrate pollutants.

III. METHODOLOGY ADOPTED



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IV. MATERIALS USED

Green Sand:

- processed from the mineral glauconitic
- Iron is removed within a wide range of pH
- removal of hydrogen, iron and magnesium through oxidation and filtration
- Remove arsenic and radium
- Physical Form Black, nodular granules shipped in a dry form
- Water pH range: 6.2 – 8.5

Zeolite:

- Zeolites porous structures accommodates cations such as Na^+, K^+, Ca^{2+} ,Mg^{2+} etc.
- Zeolites used for ion-exchange for water purification
- Zeolites are used to Separate molecules
- Zeolite is from aluminosilicate members
- The chemical formula $Na_2Al_2Si_3O_{10}.2H_20$
- Zeolites transforms on weathering

Activated Carbon

- Activated carbon used for adsorption
- Activated carbon commonly used for laboratory scale
- Low volume pores increase surface area for adsorption
- Activated carbon is carbonated at lower temperatures 450-900 C
- Activated carbon derived from charcoal
- Carbon adsorption has numerous applications in removing pollutants from both air and water

Moringa

- Moringa seeds are used as a coagulant-
- Moringa oleifera seeds treat water on two levels:
- Coagulant
- antimicrobial agent
- Moringa works as a coagulant due to positively charged:
- binds with negative charge
- forms flocs and settles
- filtration treatments with Moringa solutions will remove 90-99.9% of the impurities in water

V. PREPARATION OF SYNTHETIC ZEOLITE

- 100 gms of fly ash – muffle furnace - 800° C – cooled to room temperature
- 1:1.5 ratio- Fly ash and NaOH pellets- fusion (Melted) at 450° C
- Kept in muffle furnace for 2 hours- Brought to room temperature
- Solid substance-Powdered (Crushed)
- Synthesized Zeolite is prepared
- Rinsed with water several times to lower the *pH *NOTE: pH was increased with the use of NaOH

VI. PROCEDURES ADOPTED WITH RESULTS

a. Treatment Using Nano clay

- 5 gms OF NANOCLAY – 100 ml DISTILLED WATER
- KEPT FOR SONICATION ON SONICATOR - 1 HOUR- DISPERSION
- ULTRA-SONIC FREQUENCIES PASSED
- 10 ml EXTRACT – 100 ml SAMPLE
- 6 HOUR- WRIST ACTION SHAKER AND TEST AFTER EVERY ONE HOUR

HOURS →

Test conducted	Initial sample	1	2	3	4	5	6
pH	6.5	6.66	6.68	6.61	6.63	6.61	6.69
TDS(ppm)	1.78	1.251	1.497	1.482	1.862	1.953	1.842
EC(mS)	2.91	3.52	3.68	3.91	4.13	3.72	3.43
Suspended solids(mg/l)	50	568	564	538	547	549	561
Sulphates (ppm)	548.1	549.45	552.12	554.12	551.45	548.12	550.12

b. Treating Using Moringa

- TAKE 100ml OF WATER
- ADD 5gms OF MORINGA AND MIX IT IN MAGNETIC STIRRUR
- FILTRE THE SOLUTION AND TAKE 20ml OF EXTRACT
- PREPARE 100ml SOLUTION
- ADD THE 20ml EXTRACT TO SOLUTION
- THEN KEEP IT FOR WRIST ACTION SHAKER FOR 6HOUR AND TEST AFTER EVERY ONE HOUR

HOURS →

Test conducted	Initial sample	1	2	3	4	5	6
pH	6.5	6.402	6.481	6.451	6.579	6.6	6.38
TDS(ppm)	1.78	1.194	1.85	1.654	1.791	1.821	1.731
EC(mS)	2.91	0.445	.513	.856	.882	.862	0.83
Suspended solids(mg/l)	50	89	83	79	88	87	73
Sulphates (ppm)	548.1	520.14	508.4	497.2	454.21	432.13	421.87

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c. Treatment Using Enzymes

- Prepare 100ml of hot water(40-45°C).
- Add 1gm of enzymes into it.
- Prepare 100ml of facewash solution.
- Add 10ml of the hot enzyme extract into it.
- Keep the facewash solution for 6 hours for very gentle stirring.

HOURS →

Test conducted	Initial sample	1	2	3	4	5	6
pH	6.5	6.71	6.714	6.711	6.712	6.713	6.714
TDS(ppm)	1.78	1.30	1.015	1.253	1.359	1.213	1.164
EC(mS)	2.91	2.62	1.862	1.945	2.361	2.259	2.183
Suspended solids(mg/l)	50	38	47	50	51	48	50
Sulphates- ppm	548.1	541.44	539.45	534.77	531.44	530.1	528.77

d. Treatment Using Activated Carbon

- TAKE 5gm of activated carbon
- Mixed it in the 100ml of sample
- Kept it for wrist action shaker for 1 hour
- Test for ph ,tds, conductivity, suspended solids after every hour for a period of 6 hours
- (FOR GRANULAR)

HOURS →

Test conducted	Initial sample	1	2	3	4	5	6
pH	6.5	6.454	6.44	6.445	6.454	6.36	6.39
TDS(ppm)	1.78	.906	.88	1.649	1.704	1.553	1.473
EC(mS)	2.91	1.746	1.714	1.176	1.166	.784	.744
Suspended solids(mg/l)	50	105	330	472	920	1067	1067
Sulphates (ppm)	548.1	554.12	538.10	547.45	551.4	554.12	540.7

(FOR POWDERED)

HOURS →

Test conducted	Initial sample	1	2	3	4	5	6
pH	6.5	6.868	6.44	6.916	7.162	7.08	7.25
TDS(ppm)	1.78	.936	.92	1.482	2.312	1.95	1.842
EC(mS)	2.91	2.022	1.77	1.263	.951	1.052	.976
Suspended solids(mg/l)	50	1067	1067	1067	1067	1067	1067
Sulphates	548.1	547.45	540.7	554.12	538.10	554.12	547.42

e. Treatment Using Synthetic Zeolite

- Take 5gm of synthetic zeolite
- Prepare 100ml of distilled water
- Add the zeolite into the water
- Stir it using the magnetic stirrer for 6 hours
- Take the reading at an interval of 1 hour

HOURS →

Test conducted+	Initial sample	1	2	3	4	5	6
pH	6.5	10.05	10.05	10.07	10.06	10.04	10.05
TDS(ppm)	1.78	0.761	0.85	0.654	0.791	0.821	0.731
EC(mS)	2.91	1.471	1.731	1.279	1.567	1.713	1.483
Suspended solids(mg/l)	50	606	754	980	1067	1067	8755
Sulphates	548.1	541.44	536.11	530.77	522.76	515.42	508.1

f. Treatment Using Commercial Zeolite

- Weigh 5gm of commercial zeolite
- Take 100ml of distilled water in conical flask
- Add the zeolite to the water
- Stir the solution for 6 hour
- Note the readings for an interval of 1 hour

HOURS →

Test conducted	Initial sample	1	2	3	4	5	6
pH	6.5	5.7	5.8	5.5	5.9	5.7	5.8
TDS(ppm)	1.78	1.761	1.85	1.654	1.791	1.821	1.731
EC(mS)	2.91	0.863	.803	.856	.882	.862	0.83
Suspended solids(mg/l)	50	49	52	51	49	53	55
Sulphates	548.1	522.76	515.42	541.44	536.11	530.77	521.45

Among all the above results we have compared the results of moringa has helped at removing sulphates from the solution.

VII. FILTRATION THROUGH NANO-MEMBRANE

- preparing the synthetic soap solution
- Take 250ml of the solution and pour into the
- cylindrical column with the membrane inside
- Applying the gas for a pressure of 10 Psi
- and wait till it gets filtered
- Micro-beads are filtered out successfully
- After analysis we find that the plastic present is polyethylene

VIII. PREPARATION OF MEMBRANE FOR DEGRADATION OF PLASTICS

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1. Method adopted for degradation of plastics is by using photoelectric effect using UV
2. Neat PSf and PSf/TiO2 MIXED matrix membranes with different dosages of nano TiO2 NPs were prepared by phase inversion process
3. The casting solution was prepared by stirring known amount of NPs in 20 mL of NMf at room temperature for 5 h
4. followed by sonication for 2 h to enable uniform dispersion
5. add 15g of PSf was discharged into the above solution mixture, and stirred for 24 h to obtain a viscous solution
6. Mixed matrix membrane sheet was obtained by dipping the casted glass plate into coagulation bath containing distilled water at 25^0c.

IX. RESULT

- By the above method plastic degradation takes place due to photoelectric effect
- The plastic degradation takes place and can be noticed using the molecular weight
- The plastic degradation takes place at a rate of 80% for 30 days.
- There is an alternate method of degrading the polyethylene category of plastics, i.e. is by using bacteria psudeonema putida using a medium of Ed Agar/borth.

X. CONCLUSION

In this paper we hereby display some of the test results of our project and come up with a method of purifying the micro plastics and degrading them to some extent. And in future we plan on for degrading the micro-plastics directly from the river beds. As most of the wastes are dumped into river which may contain these plastics.

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