A REVIEW ON REMOVAL OF TURBIDITY AND TDS FROM WATER BY USING NATURAL COAGULANTS

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ABSTRACT

Untreated water is the leading polluter of water sources. Turbidity and TDS imparts enormous problem during waste water treatment. In this review study we observed that there are various types of natural coagulant which have been used in many form for removal of turbidity and TDS such as Moringa Oleifera, Cicer Arietinum, Tamarind seed Dolichas Lablab, Azadirachta Indica, Hibiscus Rosa Sinensis, Vigna Mungo, Zea Mays, Neem leaves, Coconut powder, Strychnos Potato rum seeds powder, Ground nut shell, Rice husk. These all coagulants have been used separately in water treatment but in some cases mixed with chemicals such as Aluminum sulphate, Polymerized Aluminum, Aluminum chloride. It has been found from literature review, the coagulation and flocculation process, Jar test were used predominantly in water treatment and other different type of filter media like activated carbon media, biological activated carbon media, electro dialysis, reverse osmosis process have also been used during TDS removal. The natural coagulants were found to be very effective in waste water treatment.

KEYWORDS: Waste water; Turbidity; TDS; Natural coagulant, Flocculation, Coagulation, Jar test

I. INTRODUCTION

Water is base of human life but present situation is not good because water pollution increases day by day by different reasons like industrial untreated discharge in water bodies, religious reasons, navigation in case of leakage of oil during transportation, through waste garbage directly into the water recourses which affects the aquatic life. Many types of pollution present in water, turbidity and TDS also the part of water pollution. So the treatment is required to minimize the water pollution and also to reduce the wastage of water.

1.1 Turbidity :

Turbidity is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in the air. The measurement of turbidity is a key test of water quality. Fluids can contain suspended solid matter consisting of particles of many different sizes. While some suspended material will be large enough and heavy enough to settle rapidly to the bottom of the container if a liquids sample is left to stand (the settable solids), very small particles will settle only very slowly or not at all if the sample is regularly agitated or the particles are colloidal. These small solid particles cause the liquid to appear turbid.

1.2 Causes of Turbidity in Water :

The main cause of turbidity in water is human activities. Some industries, such as mining and agriculture that causes movement of particles and gets mixed up with water. It’s caused by suspended or dissolved matter like clay and silt fine organic and inorganic matter, soluble colored organic compound, algae etc.

1.3 Effects of Turbidity :

If the water has higher turbidity level it affects the human health. In water bodies such as lakes, rivers and reservoirs high turbidity levels can reduce the amount of light reaching to the lower depth of submerged aquatic plants spieces. It also affects the ability of fish, shell fish gill to absorb the DO (dissolve oxygen).
1.4 Total Dissolved Solid:
Dissolved solids refer to any minerals, salts, metals, cations or anions dissolved in water. Total dissolved solids (TDS) comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides, and sulfates) and some small amounts of organic matter that are dissolved in water.

1.5 Causes of Total Dissolved Solid:
TDS in drinking water originate from natural sources, sewage, urban run-off, industrial wastewater and chemicals used in the water treatment process. The nature of the piping or hardware used to convert water, i.e., the plumbing. The elevated TDS has been due to natural environmental features such as mineral springs, carbonate deposits, salt deposits and sea water intrusion. The other sources may include, salts used for road de-icing, anti-skid materials, drinking water treatment chemicals, storm water, agricultural runoff, and point non-point wastewater discharges.

1.6 Effects of TDS:
Total dissolved solid changes the colour and taste of water. It also affects the human health due to presence of potassium cations, carbonates, chloride, sulphate and nitrate anions etc. The limits of TDS in different water bodies are, 500 ppm for fresh water, 500-30000 ppm for brackish water and 30000-40000 ppm for saline water.

Table 1: Industrial Wastewater Discharge Parameter after Treatment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Maximum Permissible Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH</td>
<td></td>
<td>5.5-9.5</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>Turbidity</td>
<td>NTU</td>
<td>5.0</td>
</tr>
<tr>
<td>Colour</td>
<td>TCU</td>
<td>15</td>
</tr>
<tr>
<td>Total dissolved</td>
<td>mg/l</td>
<td>500</td>
</tr>
<tr>
<td>solid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mercury</td>
<td>mg/l</td>
<td>0.01</td>
</tr>
<tr>
<td>Arsenic</td>
<td>mg/l</td>
<td>0.02</td>
</tr>
<tr>
<td>Cadmium</td>
<td>mg/l</td>
<td>1.0</td>
</tr>
<tr>
<td>Lead</td>
<td>mg/l</td>
<td>1.0</td>
</tr>
<tr>
<td>Iron</td>
<td>mg/l</td>
<td>0.01</td>
</tr>
<tr>
<td>Cyanide</td>
<td>mg/l</td>
<td>2.0</td>
</tr>
<tr>
<td>Copper</td>
<td>mg/l</td>
<td>3.0</td>
</tr>
<tr>
<td>Chromium</td>
<td>mg/l</td>
<td>2.0</td>
</tr>
</tbody>
</table>


1.7 Natural Coagulants:
The coagulant which completely based on natural source like moringa oleifera, neem leaves (Azadirachta indica), coconut shell powder etc. are used in different types of water treatment process like sedimentation,
flocculation. These are more environment friendly, reduce chemical dependency, safe for consumption, biodegradable, easily available and are low cost.

II. LITERATURE REVIEW

Priya and Palanivelu (2006) studied on removal of total dissolved solid with simultaneous recovery of acid and alkali by using bipolar membrane electrodialysis reverse osmosis. Jia et. al., (2006) removed turbidity by using activated carbon filter media and biological activated carbon filter media by adding the polymerized aluminum chloride and found 80% turbidity removal. Wonta and Ochieng (2010) studied on TDS removal by using charcoal, gravel in rough filter media. The result was found that charcoal has highest TDS removal efficiency than gravel. Asrafauzzaman et. al., (2011) tested the turbidity removal capacity by using moringa orifera (3.3 NTU), cicer-arietinum and dolichos lublub (9.5 NTU). MortulaandShabani (2012) worked on removal of TDS from industrial waste water using stones aggregates, activate allumina, activated carbon and steel slag at maximum PH. The turbidity with chlorine removal was found 99.6% with the recovery of acids and bases. Dhall et. al., (2013) used autochthonous bacteria used for the removal of total dissolved solids of pulp and paper. Ramavandi (2014) used FeCl3 as coagulent and find 95.6% TDS removal.

Nutin (2014) used new type of coagulant metal silicate for low cost treatment. The coagulant used in fine powder form for achieving the highest removal. Ramawandi (2014) conducted an experiment to evaluate the effects of turbidity, concentration, coagulant quality, water pH, humic acid concentration. The maximum removal of turbidity was 95.6% at PH <8 and optimum dose of FCE. Keith (2015) studied on removal of turbidity by using rice husk, ground nut shell and very fine sand as filter media and finds 60% turbidity removal. There are many works which have been done in past on turbidity and TDS removal. Alum was used for removal of turbidity by Mittapalli V.S.S., (2016) find the turbidity removal efficiency 46.15% over the synthetic water in the applied range (90-140NTU).

Peterson, et al., (2016) investigated the effects of a coagulants produce seeds of the Moringa oriefera in reducing turbidity 10.9 NTU (94%) and 13.7NTU (91.7%). Senthil et. al., (2016) worked on turbidity removal by strychnos potatorum seeds powder and found 68-89% removal. Katrivesis, et. el., (2016) Treat flushy raw water using electrolytes (alluminium sulphate) and polyelectrolytes (alluminium chloride) for the removal of solid and organic impurities and finds 96% turbidity removal. Muthuraman, G., (2017) used Vingna mungo as coagulent and finds turbidityremoval (90%) with zea may (76%). Keogh, et. al, (2017) used Moringa oleifera seeds powder for pre-treatment by SODIS for low turbid water (less than 30NTU) and found aqueous turbidity best with in 24hrs.

Saravanan (2017) studied on use of natural coagulants in waste water treatments and found that plants-based coagulants can be used in coagulation and flocculation process of waste water treatment. Saravaman et. al., (2017) used Hibiscus rosa sinensis, Moringa oleifera, Azadiracha indica, Dohichaslablab. Wanta (2018) used gravel charcoal for roughing filtration for removal of TDS. Tomer and Rastogi (2018) used activated carbon, neem leaves powder, coconut shell powder and charcoal powder for the removal of chloride, hardness and TDS and result was found that chloride removal was 59.52%, hardness (557mg/l from 890mg/l) and TDS 67.9% (1787mg/l from 2632mg/l). Kim et. al., (2018) worked on removal of total dissolved solid from reverse osmosis concentrates from municipal wastewater. In this study cultivated granular sludge in an aerobic sequencing batch reactor was used to treat the municipal waste with an organic loading 2.1-4.3kg COD at room temperature 25 0C.
III. CONCLUSION

It is concluded after the review of literature that the natural coagulants gives better results for turbidity, TDS, and other pollutants removal. The water treated with natural coagulants is much useful for further uses like irrigation, public uses, parks, cleaning of roads etc. The scope of natural coagulants in water treating increasing day by day as compared to other chemicals.

IV. REFERENCES


[14] Priya and Palanivelu , Removal of total dissolved solids with simultaneous recovery of acids


