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Use of Carbonised Matter from Vehicle Exhaust in Dye Adsorption for Treatment of Effluents from Dyeing Industries

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Abstract:- Dyes are principal pollutants from the industries like textile, fabric etc in water which need treatment. In this study, activated carbon was taken from vehicular exhausts. The experiments were carried out to explore Malachite Green & Methyl Orange uptake by carbonised matter. The effect of experimental factors such as adsorbent dosage & contact time was investigated by using 10 ppm of the dye solution. The adsorption equilibrium was represented by Langmuir adsorption isotherms. Adsorption of Malachite Green & Methyl Orange onto vehicle carbonised matter followed pseudo first order kinetics.

Keywords:- *Soot (Activated Carbon), Methyl Orange, Malachite Green, Kinetics.*

I. INTRODUCTION

Dyes are organic compounds which contain chromophores in them which have specific absorption spectra in the visible region of the electromagnetic radiation. They may be cationic, anionic or non-ionic and usually contain auxochromes to intensify the colour. Owing to this property, they are widely applied in textiles, printing, rubber industries, etc to colour. The processing in these industries however generates a large amount of coloured wastewater. Removal of dyes from industrial waste water from textile and manufacturing industries is a major challenge for researchers & environmentalists.

II. MATERIALS & METHODS

➢ *Adsorbate*

Malachite Green ($C_{23}H_{25}N_2$) and Methyl Orange ($C_{14}H_{14}N_3NaO_3S$) were obtained from Loba, India and were used without further purification. The solution were prepared by dissolving the required amount of dye in distilled water and alcohol.

➢ *Adsorbent*

Carbonised matter (soot) was collected from silencer of heavy load vehicles. The collected soot was transferred to a silica crucible and was kept in the muffle furnace for 2 hours at 600^0 C. The resulting activated carbon (soot) was preserved and used as an adsorbent.

III. EXPERIMENTAL METHODS

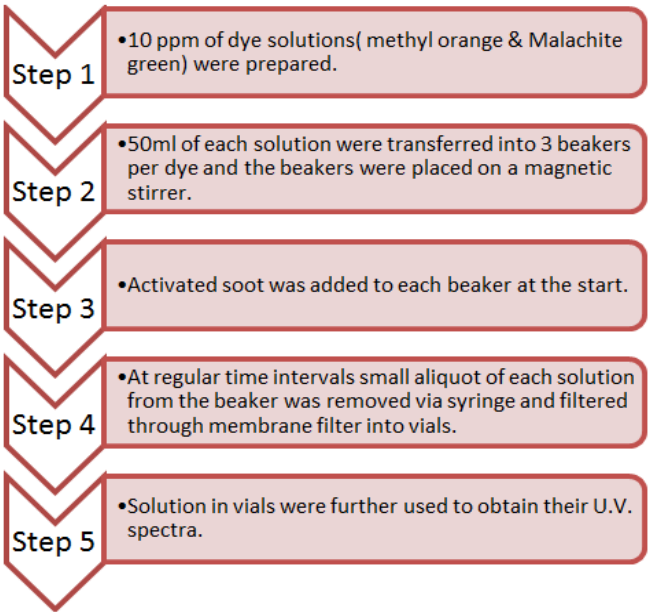

Fig 1

IV. RESULTS

The soot obtained from the exhausts of vehicle was found to be equally effective as any other animal charcoal for adsorption of dye from waste water.

➢ *Effect of Adsorbent Dose*

The adsorbent doses were varied from 5-20mg/50ml of the dye solution. The absorbance of the solution steady decreased with time & it is evident from the graphs that the dye removal increased with an increase in the adsorbent concentration. This may be due to the availability of more adsorbent sites as well as greater availability of specific surfaces of the adsorbents. The maximum adsorption of methyl orange was with 20mg of soot and that for malachite green was with10mg of soot.

➢ *Effect of Contact Time*

On approach of 5, 10, 20mg of soot with respect to Malachite green it showed maximum sorption by 10mg after 20 min.

For Methyl orange 5, 10, 20mg of soot showed maximum sorption by 20mg after 10 min.

➢ *Adsorption Kinetics*

The data for the adsorption of dye on soot were applied to pseudo first kinetic models and the data were plotted on the graph.

A. Figures and Tables

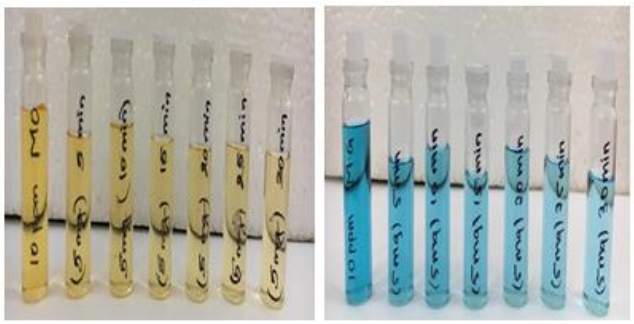

Fig 2

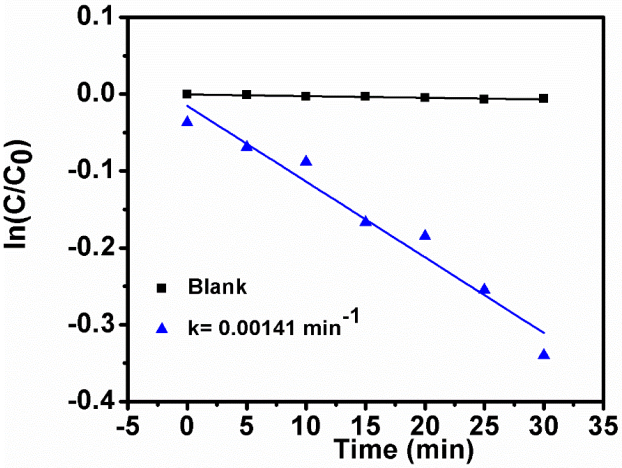

Fig 3

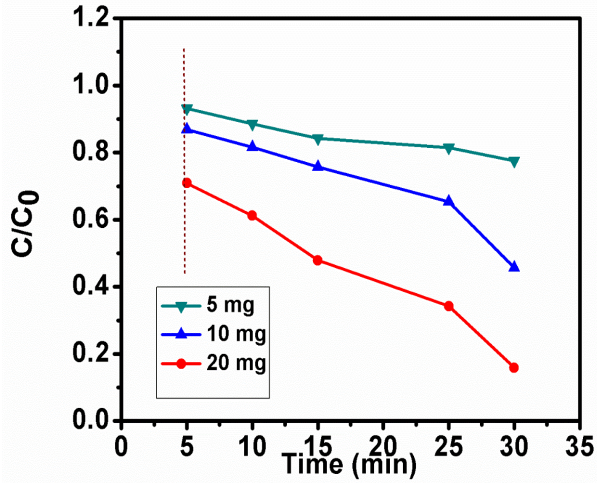

Fig 4

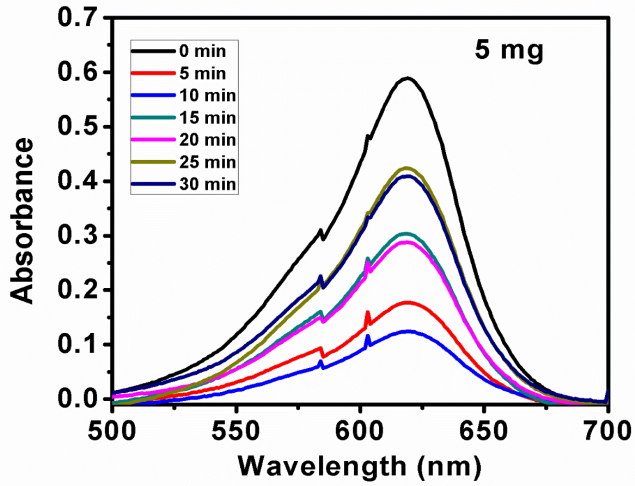

Fig 5

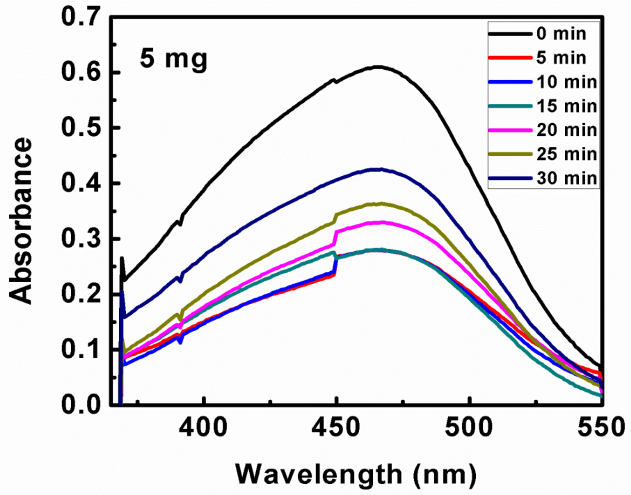

Fig 6

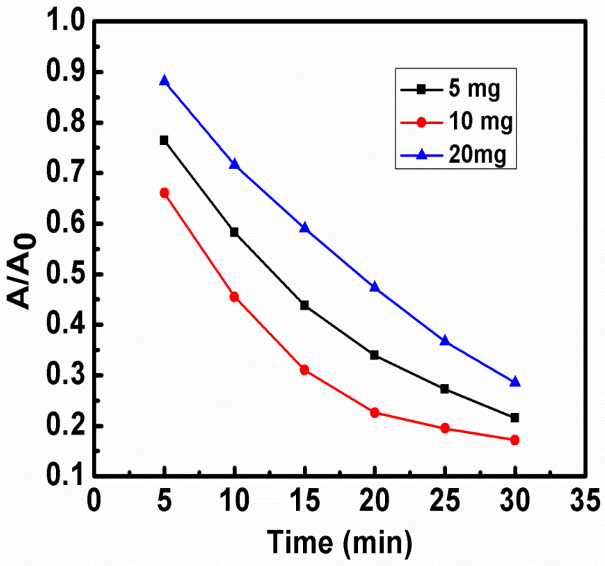

Fig 7

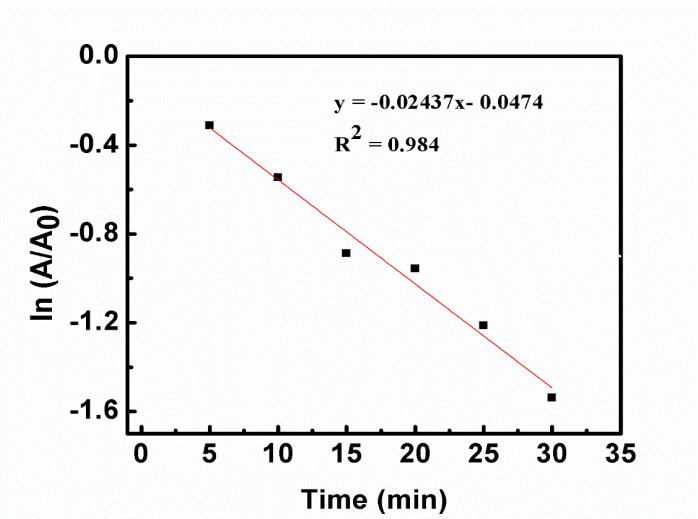

Fig 8

V. CONCLUSION

- This method shows promise in wastewater treatment using low cost adsorbents which are easily available (exhaust of vehicle).
- Two problems of environment which are effluents from dyeing industries and other, pollutants let out by the vehicles are resolved.
- There are many adsorbents available such as wood-shaving, bagasse pith, neem leaf powder, etc available but we need to carbonize them.
- Instead we have converted an hazard into useful substance i.e; for adsorption of dyes.
- From the experimental analysis we concluded that 10mg of soot collected was effective for complete adsorption after 20 min for malachite green and 20mg of soot for methyl orange
- From the graph it was concluded that both the dye follow pseudo first order kinetics

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