RESEARCH PAPER:

Isotherm studies for cod removal and devolorization of distillery waste by activated carbons

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SUMMARY

Treatment technology was developed for decolorization of effluent using three different types of activated carbons *i.e.* peanut, walnut, almond shells. Maximum decolorization occurred at dosage of 5g/100ml with PAC and AAC; 6g/100ml with WAC at pH 2, contact time of 105 minutes (PAC, WAC) and 120 minutes (AAC) and agitation speed of 100 rpm (PAC, AAC) and 150 rpm (AAC). Trend of decolorization and COD removal by three activated carbons was found to be: PAC > WAC > AAC. Peanut activated carbon was found to be best as it showed 92.47% colour removal and 44.93% COD reduction. From Freundlich isotherm, values of adsorption capacity, K_F is 11.5 L/g and sorption intensity was 7.751. Coefficient of determination, r^2, for Freundlich was 0.8661. Maximum sorption capacity for Langmuir-1 was 52.9 mg/g, for Langmuir-2 was 47.6 mg/g, for Langmuir-3 was 49 mg/g and for Langmuir-4 was 45.30 mg/g. RL value for all the four forms was less than zero from which it could be concluded that adsorption process was favourable and reversible in nature.

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Dark brown colour of distillery spentwash is due to pigment, melanoidin which is recalcitrant in nature. Conventional treatments can degrade melanoidins only upto 6 to 7% (Kalavathi *et al.,* 2001). High COD, total nitrogen and total phosphate content of effluent may lead to eutrophication of natural water bodies Disposal of sugarcane molasses wastewater on land is equally hazardous to vegetation by reducing soil alkalinity and manganese availability, thus inhibiting seed germination (Kumar, 1997). Coloured components of molasses wastewater reduce sunlight penetration in rivers, lakes which in turn decrease both photosynthetic activity and dissolved oxygen content affecting aquatic life (Mane *et al.,* 2006).

The aim of this work was to see the efficacy of three activated carbons- peanut (*Arachis hypoguea)*, almond (*Prunus dulcis*) and walnut (*Juglans regia)* shell powder to decolourize the effluent and reduce COD and to study adsorption isotherms.

MATERIALS AND METHODS

Procurement, characterization of effluent and activation of raw carbon:

Effluent used was biomethanated molasses spent wash and characterized for various parameters like pH 8.2, TS 42,400, TDS 38300, TSS 4100, hardness 1660, alkalinity 1360, DO 490, BOD 2200, COD 3800, heavy metals like chromium 1.73, nickel 0.35 and zinc 1.41 ppm, respectively were determined by standard methods (Peavy *et al*., 1985). Peanut, almond and walnut shells were treated with concentrated sulphuric acid and formaldehyde in ratio of 4:1.5. After acidification, carbon mixtures were kept in oven at 150 ^{0}C for 12 hours. The char obtained was washed with distilled water and then soaked in 1 per cent sodium carbonate to remove residual acid.

RESULTS AND DISCUSSION

The findings obtained from the present study have been discussed in the following sub heads:

Effect of adsorbent dose and contact time:

The rate of per cent decolorization was maximum for 5g of all the sorbents which slows down as the adsorbent dose was increased. The rate of adsorption increases with increase in adsorbent dosages because

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