PRODUCTION OF GOOD QUALITY CHARCOAL FROM COCONUT SHELL TO BE USED IN MARINE AQUARIUM

Ph D DISSERTATION

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ABSTRACT

Coconut shell, by-product of the Tall variety (Pin Myint Myo) coconut trees, were collected and carbonized on a large scale in a refractory brick kiln producing a yield of 23 %Coconut char. Pyrolysis was achieved by burning about 161 kg of raw coconut shells stacked in the middle of the kiln and allowed to burn slowly at the rate of 5°C hr^{-1}, the burning period was 2 days and cooling 3 days to produce about 37kg Coconut char. The optimal pyrolysis temperature during the residence time of 1day, was 500°C .The primary charcoal on analysis showed the bulk density of 52lb ft^{-3},and the proximate analysis, the moisture content (0.37%), volatile matter (51.95%) ash content(8.75%), the fixed carbon content (31.01%) and the sulphur content of (0.23%).

The primary charcoal on subjection to steam activation at different temperature indicated that the char, steam activated at 800°C, was found to produce a good quality one. The good quality char named as RKCSHS 4 (Moisure0.95%, Ash 3.42%, Volatile matter 15.2%, Fixed carbon 80.43%, Sulphur 0.21%) was found to show pronounced soptive property with regard to acidic dye methylene blue, basic dyes naphthalene black and rodamine B, as well as toward phenol and iodine. The adsorptive properties were evaluated with regard to Langmuir constant (b) and monolayer coverage X_m , which indicated the more significant value than other steam activated chars.

The prepared activated coconut charcoal showed a high fixed carbon value. The activated coconut char containing a high percent of carbon content was found to be amorphous by XRD pattern.

Sorption studies of activated coconut char coal relevant to decolorization, deodorization, removal of organic matter and utilization to remove organic compounds, toxic compounds, Color from aquarium water were studied. The high sorption capacity of activated coconut char RKCSHS 4 is known from its Langmuir monolayer coverage

value for acidic dye (napthalene black) and basic dyes (rodamine B and methylene Blue). The monolayer coverage Langmuir parameters for basic dyes methylene blue and rodamine B are higher than napthalene black.

Adsorption of basic dyes is chemisorption, acidic dyes favors physical adsorption. Even primary char RKC shows poor effiency towards organic dyes but exhibits comparable effiency to commercial activated char (Kanto) in adsorption of phenol. The char RKCSHS 4, which had been treated with 800°C heated super steam has highest ability to adsorb organic molecule phenol (Accessible surface area for RKC = $81.18 m^2 g^{-1}$ and RKCSHS4 = $138.11 m^2 g^{-1}$ and commercial activated char (Kanto) = $2.58 m^2 g^{-1}$).

In contrast to commercial activated char(Kanto) the prepared steam activated char was comparable with regard to decoloring property but show much greater sorptive property toward phenol. The commercial activated char is chemically activated carbons. Being chemically treated activated carbons are unsuitable for use in the aquarium.

All prepared chars can be used effectively to remove the toxic substances of organic pollutants from aquarium water. Colors from aquarium water can be adsorbed most effectively by 600°C heated steam passed char RKCSHS 1, RKCSHS 2. They show poor ability in other adsorption.

On the basis of what have been mentioned all primary coconut charcoal and activated charcoal have the potentiality to be useful sorbents in aquarium water and 800°C heated super steam passed char also posses ability to be used for decolorizing of organic dyes. Refractory Brick Kiln method has been found to give 37kg of good quality (GQC)charcoal from 1000 whole shells.

Key words : Good quality char, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Dissolved Oxygen (DO)