Ftir 3449 cm-1 represents the o-h stretching of

FTIR analysis was used toidentify some characteristics functional groups of adsorbent before and afteradsorption. Before MB adsorption, the FTIR spectrum contained several peaks. Figure 4.

1 showed that the broad and intense adsorption peak at 3449 cm-1represents the O-H stretching of hydroxyl functional group. The weak band ataround 2923 cm-1 is assigned for stretching vibrations of C-H bondin methyl group. The strong peak at 1654cm-1 associated to C= O in carbonyl group and the peaks at 1342 cm-1 represent -NH bending vibration of primaryamines. The peak at 1114 cm-1 correspondsto C-O stretching in primary alcohol. However, after the dyeadsorption onto adsorbent FTIR revealed that some peaks were slightly shifted. The peaks at 3449 cm-, 2923 cm-1 and 1342 cm-1 wereshifted to 3472 cm-1, 2920 cm-1 and 1384 cm-1 respectivelyafter the adsorption.

This indicates that O-H, C-H and N-H group could beinvolved in the adsorption of MB onto CFFS adsorbent (Amuda et al., 2014). The shift in the adsorptionpeak also indicates that the interaction of MB dye molecules with thefunctional groups of the adsorbent (Zhong et al., 2010). The main change observed afterthe adsorption of dye was the splitting of strong bending of C= O at around 1634cm-1 into small splits. This splitting not only due to theadsorption of dye but also due to the electrostatic interaction between MBmolecule and CFFS adsorbent (Gottipati & Mishra, 2010).

The spectrum also showed nonew peak has been observed which indicates that no chemical bond is formedbetween the adsorbate and adsorbent after adsorption and it showed that theadsorption is due to physical forces (Kaur &

Thakur, 2014). The point of zero charges (pHpzc) of CFFS adsorbent isdetermined by using solid addition method in order to understand the influenceof solution pH on the adsorption process. The surface charge of adsorbent wasexamined by comparing the pHpzc and pH of the adsorbent. Surfacecharges arise from the presence of functional groups and their interactionswith the aqueous solution (Berrazoum et al.

, 2015). The charge ofthe functional group contributes to theoverall charge of the surface. When the solution pH is higher than the pHpzc, the adsorbent surface has a negative chargewhich favours the adsorption of cationicspecies. Alternately, a solution pH below the pHpzc, results in an overall positive charge and prefer an adsorption of anionicspecies (Oyelude et al.

, 2015). The pHpzc of CFFS adsorbent was 6. 6as shown in Figure 4. 1. This value suggested that if the pH of the solution is higher that pHpzc, thesurface of the adsorbent become negatively charged and potentially forattracting negatively charged molecules (Mei, 2016). Thus, the MB removal favoured at higher pH because at lower pH (pH < pHpzc), the adsorbent surface is positively charged where H+ ionsbecome high thus compete with positively charged of MB cations for vacantadsorption site. This leads to a decrease in dye uptake on the adsorbentsurface.

(Jirekar et al., 2014). When pH of the solution is lowerthan pHpzc, adsorbent surface becomesnegatively charged and the electrostatic force of attraction with MB moleculetend to be high, thus enhance the adsorption capacity of

MB dye (Njoya, Nsami, Rahman, &Lekenengouateu, 2017)The result of physicalcharacterization of the adsorbent wastabulated in Table 4.

1 above. From the table, it was observed that CFFSadsorbent showed a low amount of bulk density, ash content, and moisturecontent. Bulk density refers to the weight per unit volume of sample. Itprovides a view regarding the floatabilityproperty of the adsorbent. Low bulk density indicates a high amount of pores thus enhance the adsorption capacity of theadsorbent (Bläker et al., 2017).

Ash content analysis isimportant to determine the content of minerals residue as well as impuritiesthat remain in the adsorbent by the heating process in the muffle furnace whilemoisture content referred as water content is an indicator used to determinethe amount of water present in the adsorbent. The result shows that the ash content and moisture content in adsorbent is 7. 21% and 10. 56% respectively. These values indicatethat CFFS adsorbent has low ash content and moisture content. The resultsobtained not only shows a good property of effective adsorbent but also showingthat this adsorbent was properly preparedand handled during the preparation stage (Ibrahim, 2013).

An adsorbent with low ash content and moisture content also possessfavourable properties of the precursorfor the production of adsorbent because it increasesthe mechanical strength of adsorbent and increasesthe adsorptive capacity (Mohammed et al., 2012).