CHAPTER 5

CONCLUSIONS

Bottom ash and FGD gypsum mixed with clay and saw dust were successfully used to produce fired adsorbent material. The physical and chemical properties of the produced adsorbent material were studied. After firing, sawdust will change to be ash leading to the high porosity with long pores that allow water and solutions pass through the material. Many elements in adsorbent materials were found such as Si, Al, Ca, Fe, and S. Reported that a mixture of solid wastes (BA, FGD gypsum, clay and sawdust) at a ratio of 22:7:45:26 and fired at 850 ^{o}C for 420 minutes (at a rate of 3 ^{o}C/minute), gives the best adsorbent material [38]. This material did not slake when soaked 30 days under water. It provided good water absorption, a strongly basic pH value, and low density. The specific surface area of the adsorbent material measured by using the Brunauer–Emmet–Teller method was 4.81 m^2/g.

In this experimental work, the adsorptions of methyl orange and I_2 (in the form of triiodide) from aqueous solutions by using the adsorbent material were investigated. AM has been demonstrated to be highly effective for the removal of the anionic dyes with an adsorptions equilibrium time at 80 min and 60 min, respectively. The adsorption isotherm is correspond to both the Langmuir model and the Freundlich model, indicating that adsorption might occur by monolayer coverage. The adsorbed amounts of both MO and iodine increased gradually with increasing equilibrium concentrations. From Langmuir plot, the maximum adsorbed amount of methyl

orange was 0.0107 mmol/g which was approximately the same amount as that adsorbed on bottom ash (3.618 mg/g) [13]. The maximum adsorbed amount of iodine was 1.36 mmol/g or 345 mg/g, which was much higher than the adsorbed methyl orange. This might be due to the smaller size of iodine that provided it easier to penetrate into the hollow sites on the surface. The magnitude of b quantifies the relative affinity that a given solute has for surface adsorption. The Freundlich constant, n also indicates the degree of favorability of adsorption. A smaller value of n closed to one indicates an intermediate bond between adsorbate and adsorbent, while a higher value for K_F indicates rate of adsorbate removal is high.

The low price and abundance of this adsorbent material make this material particularly promising for the removal of dyes in industrial wastewater treatment.