CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

Porous clay heterostructures (PCHs) derived from Na-bentonite clay has been synthesized by a surfactant directed assembly of silica species within the clay galleries. In this work was to modify the PCH derived from bentonite clay for the mesopores in the clay and study the effect of molar ratio of dodecylamine/TEOS to the pore characteristic. The ferric chloride hexahydrate was added to PCH for inducing the magnetic properties for food packaging. From the analysis of N_2 adsorption-desorption data, the results show that PCHs had surface areas of 412–688 m^2/g, an average pore diameter in the supermicropore to small mesopore range of 4.06–7.86 nm, and pore volume of 0.70–0.83 cc/g, while magnetic PCHs had a result of 148–170 m^2/g, 12.17–14.58 nm, and 0.51–0.66 cc/g, respectively. Moreover, the shape of the N_2 adsorption-desorption isotherms of these products are very similar which belong to a type IV BET isotherm, and also indicated that the framework pore sizes are in the supermicropore to small mesopore region. The ethylene adsorption capacity of these porous clays was investigated using gas chromatography. The results reveal that the enhancement of the %Fe ions on PCH plays an important role in ethylene adsorption. There was no obvious peak observed in the XRD patterns of magnetic PCHs due to the disordered structure of silica framework as investigated by XRD. SEM images, EDX micrographs and UV adsorption of magnetic PCHs showed successful incorporation of Fe ions in PCH. Magnetic PCH exhibited a remarkably significant bacteriostatic effect against *Escherichia coli* and *Staphylococcus aureus*. After the magnetic PCHs (20% wt Fe ions) were obtained, the magnetic PCHs nanocomposites of PLA were prepared via direct melt intercalation by using a twin screw extruder. The dispersion of the 1 wt% magnetic PCH in PLA matrix is improved by incorporating 5 wt% of PCL as a compatibilizer. Subsequently, they were fabricated to thin sheet by compression molding machine. According to thermal properties, the T_g and T_m of PLA/5%wt PCL were lower than neat PLA. The thermal properties of PLA/5%wt PCL/1–4%wt magnetic PCH nanocomposites increased with content of magnetic PCH. From XRD results, the silicates of magnetic PCH were exfoliated in PLA nanocomposites. The PLA

nanocomposite showed lower the oxygen gas permeability rate than neat PLA. Results of antibacterial testing and the oxygen gas permeability showed that PLA nanocomposite can extend shelf life of meat packaging.

Recommendations

The magnetic PCHs at various Fe content should be tested antibacterial. The PLA nanocomposites should be blended at various ratio of polymer: compatibilizer: nanofiller to find the suitable generic for blowing film and the mechanical effects should be investigated.