

## **CHAPTER V**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Conclusions**

Chitin whisker-reinforced nanocomposite films were prepared by blending colloidal suspension of chitin whiskers with poly (vinyl alcohol) (PVA) and chitosan solution as polymer matrix. The chitin whiskers consisted of slender parallel rods with a broad distribution in length. The average length and width were around 417 and 33 nm, respectively. The average aspect ratio of these whiskers was around 17. The whisker-reinforced films showed higher crystallinity as chitin whisker content increased. For mechanical properties, the nanocomposite films exhibited an improvement in tensile strength. The improvement in tensile property indicated the existence of whisker-polymer matrix interaction within the nanocomposite films. Percent weight loss of chitin whisker-reinforced films after immersion in water decreased with increasing chitin whisker content. Heat treatment could generate crosslinking within the films as evidenced by the decrease in weight loss of the steamed films when compared to the non-steamed films. For swelling behavior, the degree of swelling also decreased when chitin whisker content increased. The weight loss and degree of swelling of the nanocomposite films could be reduced by heat treatment as well as the addition of chitin whiskers. It can be concluded that chitin whiskers from shrimp shell can be used as reinforcing phase to prepare nanocomposite films with improved tensile property and heat treatment in the autoclave can promote crosslinking formation in the nanocomposite films.

#### **5.2 Recommendations**

The results indicated that the chitin whisker-reinforced PVA films and chitin whisker-reinforced chitosan film exhibited higher tensile strength than an unreinforced film. However, further studies on the variation in other polymer matrix, thickness of the films, etc. should be studied in order to obtain nanocomposite films for various applications.