CHAPTER 4

CONCLUSION

4.1 Synthesis of zinc oxide via a microwave radiation method

In this work, ZnO nanocrystals were successfully synthesized via microwave radiation method at 180 W for 30 min. Pure water and a variety of poly ethylene glycol (PEG200, 400, 600) were used as liquid media. ZnO powders prepared using H_2O as liquid medium were nanoparticles but, the products prepared using PEG as liquid media were nanorods. The length and crystallinity of nanorods were increased with the molecular weight of PEG increase. In addition, we have synthesized ZnO nanocrystals by using different amount and MWs of PEG as a surfactant. By using 10 g PEG20000, the complete flower-like shape of nanorods was produced.

PL spectra showed an intense, sharp and dominate peak at 370 nm in the UV region which was attributed to near band edge emission. The intensities for the products synthesized in PEG were higher than that for the product synthesized in water. They were increased with the amount and MWs of PEG increase. There results shows that PEG played an important role in the product formations, morphologies and PL intensities.

4.2 Synthesis of zinc oxide via ultrasonic radiation method

ZnO nanocrystals with different morphologies were synthesized using ultrasonic radiation method. A various factors influencing on the final morphologies of ZnO such as $Zn(NO_3)_2$ to NaOH ratios, reaction time and the amount and MWs of PEG were studied.

The varieties of $Zn(NO_3)_2$ to NaOH ratios (1:5, 1:10, 1:15, 1:20) were used in ultrasonic reaction. At 1:5 mol ratios, they were plate shaped-particles. When more NaOH was added to achieve 1:10, 1:15 and 1:20 ratios, the samples were nanorods in flower-like clusters. In addition, the crystallinity of the products was increased with the $Zn(NO_3)_2$ to NaOH ratios decrease.

For 1 h ultrasonic reaction, the products were composed of short nanorods in cluster. When the time was prolonged, the products became larger, and the rod shape particles in flower-like clusters were detected in the solution of 5 h synthesis.

The effect of PEG20000 in this reaction system was also investigated, and the amount of PEG20000 seemed to be a critical parameter in controlling the shape and size of ZnO nanostructures. The SEM results verified that complete flower-like shape could be synthesized by using appropriate amount of PEG.