Research Title Preparation of ZnO - CuO nano-composites material for polyethylene antimicrobial food active packaging

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This research aims to study the preparation of ZnO - CuO nano-composites material by spray pyrolysis, coprecipitation and solid-state reaction teachnique for polyethylene antimicrobial food active packaging. The effect of synthesis conditions to the particle morphology and antimicrobial property were studied. The morphology of nanocomposite products were studie by Scanning electron microscope (SEM), the crystal structure phase were confirmed by X-ray diffraction (XRD) and the local structured were investigated by X-ray absorption spectroscopy (XAS) technique. The antimicrobial efficiency was investigated by zone inhibition method.

The result found that in this spray pyrolysis reactor was not suitable technique for synthesis due to high flow rate necessary for spray and the reaction was not complete in a short time even in high temperature at 1,300^{o}C, more over, very low productivity were obtained.

The well mixed composite and controllable phase ratio fraction of ZnO - CuO nanocomposites material can be obtained by co-precipitation technique. The hexagonal zinc oxide plate, zinc oxide rod, copper oxide nanowire and copper oxide hierarchical dandelion-like particles can be obtained by control synthesis parameter such as ioninic type, ionic concentration, precursors ratio and precursor concentration. Results of pathogens inhibition revealed that the synthetic zinc oxide more effective than both zinc oxide commercial and nano zinc oxide grad. Zinc oxide plate shape show more effective than zinc oxide rod shape. Copper oxide nanowire was the highest antimicrobial activity.

ZnO - CuO nanocomposites material and Cu doped ZnO nanoparticle were successful synthesis by deviloped solid-state reaction technique. The mixed phase

particles obtained were confirmed by SEM and XRD. Particle size less than 50 nm and uniform morphology were obtained. The result from XAS spectra shown that copper ion substitute zinc ion in lattice obtained. Antimicrobial activity show Increase with the copper ratio increase. The best antimicrobial efficiency was obtained at 10% copper precursor.