

CHAPTER V

CONCLUSIONS

Silver nanoparticles were synthesized by thermal reduction of sprayed silver salt. The optimum condition for synthesized silver nanoparticles was silver nitrate 0.5 mmol/L, glucose 0.5 mol/L and ammonia solution 0.0110 mol/L using air as a carrier gas. The precursors were nebulized at flow rate of 3.5 L/min into tubular reactor with internal temperature at 120 °C and. From TEM images, the synthesized silver nanoparticles had spherical shape with diameter range between 10-20 nm confirmed by the UV-Visible extinction spectra showing absorption maxima at 399.05 and FWHM at 58.05 nm. UV-Visible spectroscopy indicated the small particles with narrow size distribution. The synthesized silver nanoparticles were stable for one month and have and gave 63.03 %yield. Moreover, this method was a continuous flow process and using non-toxic reducing agent. Therefore, the thermal reduction of sprayed silver salt method can be applied for synthesizing silver nanoparticles in industrial scale. However, this method still needs additional study for highest efficiency when applied to mass scale production.

In this study, flow-rate applied to nebulizer was varied in order to study the effect of the size and size distribution of droplet but this changing also affected other parameters such as resident time, temperature in tubular reactor, and trapping efficiency. Therefore, the effects of precursor droplet size and size distribution on the size and morphology of synthesized silver nanoparticles were still unclear.

The concentration of silver nitrate exhibits no effect on the size of synthesized silver nanoparticles. This indicated that this reaction was not the single droplet to single silver nanoparticle approach. Thus, we cannot adjust the concentration of silver nitrate to obtain the silver nanoparticles in difference size, just like spray pyrolysis method. However, the reaction in droplet as a micro-reactor enables the rapid

nucleation and limits the possibility of aggregation which always produce small and narrow size distribution silver nanoparticles.