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SYNTHESIS OF SILVER NANOPARTICLES BY THERMAL REDUCTION OF SPRAYED SILVER SALT

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การสังเคราะห์อนุภาคเงินนาโนโดยการรีดักชันด้วยความร้อนของละอองเกลือเงิน เป็นวิธีการรีดิวส์เกลือของเงินภายในละอองขนาดเล็ก เปรียบเสมือนเป็นอุปกรณ์ในการเกิดปฏิกิริยาขนาดเล็กระดับไมโครเมตร ทำให้สามารถสังเคราะห์อนุภาคเงินนาโนที่มีขนาดที่แน่นอนได้ สารตั้งต้นคือ ซิลเวอร์ไนเตรท กลูโคส และ สารละลายแอมโมเนีย วิธีการนี้สามารถสังเคราะห์อนุภาคเงินนาโนได้ในปริมาณมาก เนื่องจากเป็นกระบวนการที่สามารถสังเคราะห์ได้อย่างต่อเนื่อง การวิเคราะห์ขนาด การกระจายตัวของอนุภาค และรูปร่างของอนุภาคเงินนาโนที่สังเคราะห์ได้โดยใช้ ยูวี-วิสิเบิล สเปกโทรมิเตอร์ และกล้องจุลทรรศอิเล็กตรอนแบบทรานมิสชัน ได้ทำการศึกษาปัจจัยต่างๆเพื่อสังเคราะห์อนุภาคเงินนาโนที่มีขนาดเล็ก มีการกระจายตัวที่แคบและมีสเถียรภาพโดยไม่ต้องใช้สารคงสภาพ ซึ่งวิธีการนี้สามารถสังเคราะห์อนุภาคเงินนาโนทรงกลมมีขนาดอยู่ในช่วง 10 ถึง 20 นาโนเมตร และมีการกระจายตัวของอนุภาคที่แคบ อนุภาคเงินนาโนที่สังเคราะห์ได้มีสเถียรภาพพอสมควร สามารถเก็บรักษาได้เป็นระยะเวลาประมาณ 1 เดือนโดยขนาดและการกระจายตัวของอนุภาคไม่เปลี่ยนแปลง

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WEE PATANAPERADEJ: SYNTHESIS OF SILVER NANOPARTICLES BY THERMAL REDUCTION OF SPRAYED SILVER SALT. THESIS ADVISOR: ROJRIJ ROJANATHANES, PH.D., THESIS CO-ADVISOR: ASSOC. PROF. SANONG EKGASIT, PH.D. 85 pp.

Silver nanoparticles were synthesized by thermal reduction of sprayed silver salt. This method is based on the reduction of silver salt in droplet as a micro-reactor that allows the synthesized particles of definite sizes. The precursor was the mixture of water, silver nitrate, glucose (reducing agent) and ammonia solution. This procedure is a continuous process that can be verified for mass scale production. The size, size distribution and morphology of the synthesized silver nanoparticles were characterized by UV-Visible spectroscopy, and transmission electron microscopy (TEM). The composition was varied in order to produce stabilized silver nanoparticles with a narrow size distribution without any stabilizer or capping agent. The results indicated the synthesized silver nanoparticles have spherical shape, small size with diameter of 10-20 nm with a narrow particle size distribution. The synthesized silver nanoparticles were fairly stable for a month without any stabilizer.

Department of study ....Chemistry........ Student's signature ....

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LIST OF ABBREVIATIONS

$AgNO_3$	: silver nitrate
LSPR	: localized surface plasmon resonance
nm	: nanometer
DNA	: Deoxyribonucleic acid
Ag	: Argentum (silver)
Au	: Aurum (gold)
M	: Metal
PVP	: polyvinylpyrolidone
SDS	: sodium dodecyl sulfate
FWHM	: Full width at half maxima
TEM	: Transmission electron microscopy
NIR	: near infrared
eV	: electron volt

LIST OF SYMBOL

A	: absorbance
ε	: absorption coefficient
b	: optical path length
c	: concentration
E	: redox potential of particles
E_{redox}	: solution potential
σ_{ext}	: extinction cross-section
σ_{sca}	: scattering cross-section
I_0	: intensity of incident beam
I	: intensity of transmitted beam
℃	: Celsius
V	: volume
ρ	: density