شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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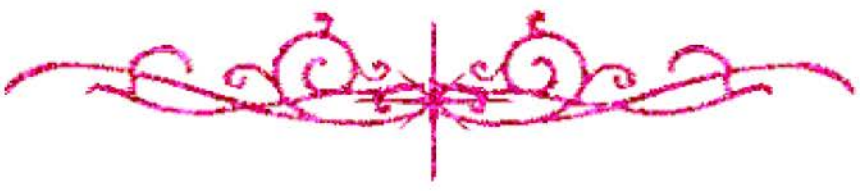

بالرسالة صفحات لم ترد بالأصل

Nanocoating of Metallic Nanocrystals: Study of the Effect of Crystal Shape and Shell Thickness on Their Optical Properties

Thesis

Submitted to National Institute of Laser Enhanced Sciences

By

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In Partial Fulfillment of the Requirement for the Degree:

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Approval Sheet

Title of thesis:

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Degree: Master in Laser science (photochemistry and photobiology)

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Date: / / 2006

Dedicated to my

Parents,

my brothers,

my sisters,

and my wife

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I thank God for the little knowledge that he has communicated to me. It is only by his well that provids me with opportunities which improved the quality of my life.

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Summary

Nanoprisms, snapped prisms and nanorods of gold particles have been obtained chemically. New absorption features different from that of the classical surface plasmon absorption bands of rods and spheres are found to be associated with the appearance of the nanoprism, and snapped prism shaped gold nanoparticle in the TEM images. We were able to modify the seed method in order to get more control on the shape of the gold nanoparticles and we developed a new method to prepare gold nanoprisms by changing the concentration of seed and Ag^+ ions. Our results indicate that the presence of Ag^+ ions and the seed concentration are the key parameters for obtaining the anisotropic shape of gold particles, and their concentrations play an important role in controlling the shape of the particles, e.g. rods, prisms or snapped prisms.

We developed a method to coat different shaped gold nanoparticles (spheres, rods, and nanoprisms) and we determined the critical condition at which alloying occurred instead of coating.

The thermal and photostability of these different shapes and coated particles have been studied. Great enhancement of the thermal stability has been achieved by adding specific amount of polyvinyl pyrrolidone (PVP) to the gold particles of different shapes capped with cetyltrimethylammonium bromide (CTAB). It is worth to mention that our gold nanorods stabilized by PVP are totally stable up to 220 °C. Optically, these gold particles stabilized by PVP are remarkably much stable towards UV light and even upon exposure to Nd-Yag pulsed nanosecond lasers.

The electron and phonon dynamics of these different shaped particles have been studied using femtosecond pump-probe technique. We found that the fast decay component which refer to electron- phonon (e-ph) coupling does not depend on the particle shape, while, the ph-ph coupling is much slower in dots than in rods and prisms. This is due to the large surface area of the nanoprism compared to that of the rods or spheres.

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