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Synthesis of Gold Nanorods with Different Aspect Ratios for Sensing Applications

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Gold nanorods show great potential in applications such as imaging, drug delivery, photothermal therapy and biosensing. The optoelectronic properties strongly depend on their sizes and shapes. In this work, gold nanorods with different aspect ratios are synthesized by a seed-mediated growth method. The gold seeds are prepared by the reduction of Gold (III) chloride trihydrate ($HAuCl_4$) with sodium borohydride ($NaBH_4$) and cetyltrimethylammonium bromide (CTAB). In the growth process, the role of silver ion and pH on the formation of rod shapes is investigated. The gold nanorods are characterized using transmission electron microscopy (TEM) and UV-visible spectroscopy. The results show that the amount of silver ion yields gold nanorods with different aspect ratios. At high concentration of silver ion, the rectangular shape is observed. In the presence of hydrochloric (HCl) solution, the growth rate of gold nanorods is lowered. The gold nanorods are observed in higher aspect ratio. The localized surface plasmon resonance (LSPR) wavelength of the gold nanorods are shown at 520 nm and 740 nm, corresponding to the transversal and longitudinal plasmon resonance, respectively. The aspect ratio of nanorods can be tailored by varying the amount of silver ion and acidic condition. This method could be used to selectively produce gold nanorods with different sizes and shapes for sensing application.

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