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# Electrochemical Synthesis of Selenium Nanoparticles and Formation of Sea Urchin-like Selenium Nanoparticles by Electrostatic Assembly

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**Abstract:** Electrochemical synthesis had been proved to be a versatile and simple approach for the preparation of nanoparticles. In this work, an electrochemical method was successfully applied to synthesis selenium nanoparticles (SeNPs) via using selenium powder doped carbon paste electrode. SeNPs were spherical with diameters of about 85, 43 and 60 nm and well dispersed in the presence of sucrose, polyvinylpyrrolidone and sodium dodecyl sulfonate (SDS), respectively. Surprisingly, when adding cetane trimethyl ammonium bromide (CTAB) into the spherical SeNPs modified with SDS, spherical SeNPs changed to urchin-like SeNPs by electrostatic assembly. The effect of SDS and CTAB on the morphology of SeNPs was investigated.

**Key words:** Nanoparticles; Selenium; Electrochemical synthesis; In situ modification; Electrostatic assembly; Amorphous materials

## 1. Introduction

The essential trace mineral, selenium, is well known for its semiconductor properties in the fields of photovoltaic cells, photoconductor, photographic exposure meters, rectifiers and xerography [1,2], and its fundamental importance to human health in cardiovascular disease, cancer, and immune function [3,4]. It has been reported that selenium nanoparticles (SeNPs) display excellent biological activities, low toxicities and important therapeutic properties, which perform greater potentials than other Se species [5-7]. Fabrication of Se nanomaterials with controlled shapes

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