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Electrochemical Deposition of Carambolalike Ytterbium Hexacyanoferrate(II) and its Application in Electrocatalysis

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Abstract A facile electrochemical approach was developed for controllable synthesis of ytterbium hexacyanoferrate(II) (YbHCF(II)) carambolalike microparticles. The prepared samples were characterized by XRD, EDS and SEM techniques. The composition of YbHCF(II) sample could be assigned to be $KYb[Fe(CN)_6] \cdot xH_2O$. By controlling the synthetic conditions, such as applied potential and deposition time, the size and surface morphology of the synthesized materials could be well controlled. The modified Au electrode by YbHCF(II) carambolalike microparticles possesses prominent electrocatalytic activity toward the reduction of hydrogen peroxide.

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Electrochemical Deposition of Carambolalike Ytterbium

Hexacyanoferrate(II) and Its Application in Electrocatalysis

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Keyword: Electrochemical deposition; Carambolalike; Ytterbium Hexacyanoferrate; Electrocatalysis

Abstract: A facile electrochemical approach was developed for controllable synthesis of ytterbium hexacyanoferrate(II) (YbHCF(II)) carambolalike microparticles. The prepared samples were characterized by XRD, EDS and SEM techniques. The composition of YbHCF(II) sample could be assigned to be $KYb[Fe(CN)_6] \cdot xH_2O$. By controlling the synthetic conditions, such as applied potential and deposition time, the size and surface morphology of the synthesized materials could be well controlled. The modified Au electrode by YbHCF(II) carambolalike microparticles possesses prominent electrocatalytic activity toward the reduction of hydrogen peroxide.

Introduction

Metal hexacyanoferrates (MHCFs) have attracted considerable interests due to their attractive electrocatalytic, ion-sensing and ion-exchange properties. Of interests, the electrodeposition and applications of transition-metal hexacyanoferrates have been widely studied, especially as the effective catalysts for hydrogen peroxide [1-3]. In particular, the synthesis and/or properties of lanthanide hexacyanoferrate (LnHCF) (that is, Ln = La, Ce, Pr, Nd, Sm, Eu, Gd, Tb and Dy) have been investigated. As an analog, ytterbium hexacyanoferrate (YbHCF) may have the similar electrocatalytic properties to these LnHCFs. However, to the best of our knowledge, very few reports have been found regarding electrochemical preparation and electrocatalytic properties for ytterbium hexacyanoferrate(II) (YbHCF(II)).

During the past several years, the development of reliable, simple and efficient route to large amounts of uniformly sized and novel structured materials has been one of the main goals in materials chemistry research. Many kinds of MHCFs have been successfully synthesized via various preparation methods. However, most of the methods have been focused on photo-inducing or protecting using organic materials [4-7]. The products having mostly cube, and the shape- and size-dependent properties of MHCFs have been seldom reported. Therefore, controlling the growth of MHCFs under spatial confinement is a promising subject.

Herein, a facile amperometric method is reported to synthesize carambolalike YbHCF(II) microparticles. The structure, composition and morphology of the YbHCF(II) were characterized with techniques such as X-ray powder diffraction (XRD), energy-dispersive X-ray spectrum (EDS) and scanning electron microscopy (SEM). The YbHCF(II) modified Au electrode exhibits good electrocatalytic activity toward the reduction of hydrogen peroxide.

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