Synthesis, Crystal Structural and DFT calculations of a Novel Lead(II) Organic-Inorganic hybrid: A Precursor to Produce Pure Phase Nano-sized Lead (II) Oxide

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The design of crystal structures and control of molecular arrangements of coordination polymers has attracted much attention in recent years [1]. The coordination chemistry of lead(II) with N and O donor ligands has been investigated in the past decade and frequently discussed in regard to the coordination and stereoactivity of the valence shell lone electron pairs [2,3]. In recent years many kinds of coordination materials have been prepared by the several methods. It should be emphasized that there are different methods to synthesize nano- and micro-crystalline metal oxide such as microwave-solvothermal synthesis, hydrothermal route and surfactantligand co-assisting solvothermal synthesis [4]. Herein we report the preparation and crystal structure of novel polymeric lead(II) compound $[Pb_2(dmp)_2(N_3)_2(ClO_4)_2]_n$ (1), and its use in the preparation of PbO nano-particles. The new structure was characterized by FT-IR, ^{1}H NMR and ^{13}C NMR spectroscopy and studied by X-ray crystallography. The structure of title complex has been optimized by density functional theory. Structural parameters and IR spectra for title complex are in good agreement with the crystal structure. The PbO nanoparticles were obtained by thermolysis of 1 at 180 °C with oleic acid as a surfactant. The scanning electron microscopy shows that the size of the PbO particles are ~70 nm.

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Design and fabrication a novel dysprosium optical sensor based on immobilization of N'-[(2-hydroxyphenyl)methylene] benzohydrazide on a nano fibers PVC membrane

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In this work, for the first time, a novel optical chemical sensor has been developed for the determination of dysprosium (Dy) in aqueous solutions using N'-[(2-hydroxyphenyl)methylene] benzohydrazide (BBH) as a complex agent. The optode membrane was prepared from plasticized nano fibers PVC. Formation of the complex between dysprosium (III) and BBH caused a new peak to appear with a maximum absorbance at 338 nm. The parameters involved in the preparation of the optode and determination of dysprosium (III) were optimized. In the universal buffer with pH 5.0, the optode had a dynamic range of 3.3×10^{-9} to 7.0×10^{-8} mol L^{-1} dysprosium (III) with a detection limit of 0.75×10^{-9} mol L^{-1}. The response time of the sensor was 90 s. The sensor was successfully regenerated with a EDTA (0.1M) solution.

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Insitu Functionalization of Some Alkandithiols on Gold Electrode and Electrochemical Investigation of The Prepared Quinone Terminated Self Assembled Monolayers

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As an essential part of nanotechnology self-assembled monolayer (SAM) is a simple strategy for making ensembles of nanostructures [1, 2]. Preparation of quinone SAMs can be helpful in modeling proton transfer in biological process[3]. In this work some alkanedithiols assembled as monolayer on gold (Au) electrode. 1,4-butanedithiol, 1,6-hexanedithiol and 1,8-octanedithiol were used as alkanthiols in 1mM ethanolic solution. The formation of prepared alkanedithiols SAMs were investigated by cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) in 0.1M phosphate buffer (pH 7) containing 1mM $Fe(CN)_6^{4-/3-}$. Results of CV and EIS showed the formation of densely packed SAMs on the electrode. The prepared SAMs were employed insitu functionalization with quinone by Michael addition reaction in 10 mM of benzoquinone, phosphate buffer pH 9. Appearing cyclic voltammograms confirmed that S-atom thiols participate in a Michael addition with benzoquinone in solution. Peak separation increased by increasing number of carbons the alkyl chain of the SAMs about 50mV. The half peak potential ($E_{1/2}$) of the quinone terminated SAMs moved to less positive by increasing pH of the solution. The surface coverage (Γ) and apparent heterogeneous rate constant (k_s^{app}) of the quinone SAMs estimated using EIS and CV techniques. The tunneling barrier coefficient, β, of the quinone SAMs was determined from relationship between the alkyl chain length and k_s^{app}.

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Investigation effect use of nano octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine in composite modified double base propellant

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With attention to different and improved properties that obtained with reducing the particle size, use the ultrafine materials are noteworthy of researchers in different fields such as pharmaceutical, electronics, explosive materials and etc. ultrafine powder is