INTERACTION OF OXOANIONS WITH GOLD NANOPARTICLES MODIFIED BY PORFYRIN-BRUCINE CONJUGATE STUDIED BY ECD SPECTROSCOPY

Lenka Veverková, Ondřej Julínek, Pavlína Novotná, Kamil Záruba, Vladimír Král
Institute of Chemical Technology, Department of Analytical Chemistry,
Technicka 5, 166 28 Prague 6, Czech Republic,
Lenka.Veverkova@vscht.cz

The development of molecular sensors for detecting selectively chemically and biologically important anionic species has become a major research project in supramolecular chemistry. It is still a challenge to find and study materials capable of recognizing and sensing anions in aqueous media [1]. The possible use of modified porphyrins as selector is based on formation of non-covalent π-π complexes between porphyrins core and planar analyte together with additional binding modes, like H-bonding, coulombic interaction [2]. Immobilization of porphyrin derivative on surface of nanoparticles allows studying interaction in environment in which selector in insoluble [3].

The goal of this work was to study the interaction between oxoanions and porphyrin-brucine conjugates [4] in methanol-water solution and water, the influence of gold nanoparticles on the interactions was also studied.

Nowadays, gold nanoparticles are often prepared by chemical reduction of Au(III) [5]. Sodium citrate belongs to the most usable reducing agents [6] to prepare citrate stabilized gold nanoparticles. Mercapto-derivatives have been commanly used as modifiers of gold nanoparticles in recent years. 3-Mercaptopropionic acid (3-MPA) represents such a compound. At basic pH Nanoparticles modified by 3-MPA have negative charge on the surface due to carboxylate groups. This allowed immobilization of porphyrin conjugates which have positive charge due to quaternary nitrogen atoms by ionic bond. Ionic this immobilization of porhyrine can be. Also carried out by direct immobilization of porphyrin conjugates on non-modified gold nanoparticles because of their negative surface charge.

The method based on the reduction of K[AuCl4] by citrate was used to prepare 15 nm average size gold nanoparticles (ref. 5). The immobilization of porphyrin conjugates was carried out by two different ways of ionic interaction. First, direct immobilization of conjugate on nanoparticles, second, immobilization of conjugate on 3-MPA premodified gold nanoparticles. Such prepared nanoparticles were purified by centrifugation and characterized. Interactions of oxoanions (NO3-. H2PO42-, SO42-, ClO3-, ClO4-, HCO3-, ReO4-) with porphyrin-brucine conjugates in methanol-water solution and water were studied by ECD spectroscopy. Stability constants for complexes of porphyrin-brucine conjugates with oxoanions were calculated and the effect of gold nanoparticles will be described.

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References:

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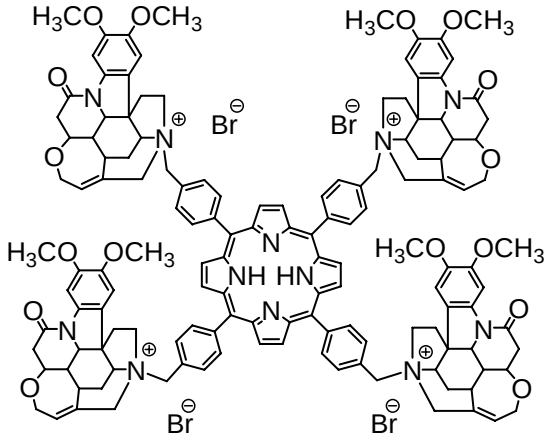
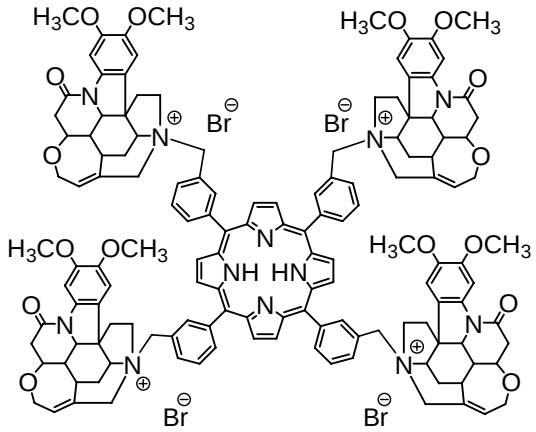
Figures:



p-porphyrin-brucine conjugates



m-porphyrin-brucine conjugates