Effect of gold and silver nanoparticles on interactions of porphyrin-brucine conjugates with oxoanions NO_3^-. $H_2PO_4^{2-}$, SO_4^{2-}, ClO_3^-, ClO_4^-, HCO_3^-, ReO_4^-

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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 selectors is based on formation of non-covalent π-π complexes between the flat porphyrin core and planar analytes together with additional binding modes, like H-bonding, coulombic interactions etc. [2] Immobilization of porphyrin derivatives on the surface of nanoparticles allows studying interaction in environment in which the selector is 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 and silver nanoparticles on the interactions was also studied.

Nowadays, gold nanoparticles are often prepared by chemical reduction of Au(III), silver nanoparticles by chemical reduction of Ag(I) [5]. Sodium citrate belongs to the most usable reducing agents [6] to prepare citrate stabilized nanoparticles. Mercapto-derivatives have been commonly used as modifiers of nanoparticles in recent years and 3-mercaptopropionic acid (3-MPA) used here belongs this group. 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 interaction.

The method based on the reduction of $K[AuCl_4]$ and $AgNO_3$ by citrate was used to prepare 15 nm average size gold nanoparticles [5] and 45 nm average size silver nanoparticles. The immobilization of porphyrin conjugates was carried out by two different ways of ionic interaction. Direct immobilization of conjugates on nanoparticles and immobilization of conjugates on 3-MPA premodified nanoparticles were applied. Interactions of oxoanions (NO_3^-. $H_2PO_4^{2-}$, SO_4^{2-}, ClO_3^-, ClO_4^-, HCO_3^-, ReO_4^-) with porphyrin-brucine conjugates in methanol-water solution and water were studied by UV-Vis and ECD spectroscopy [7].

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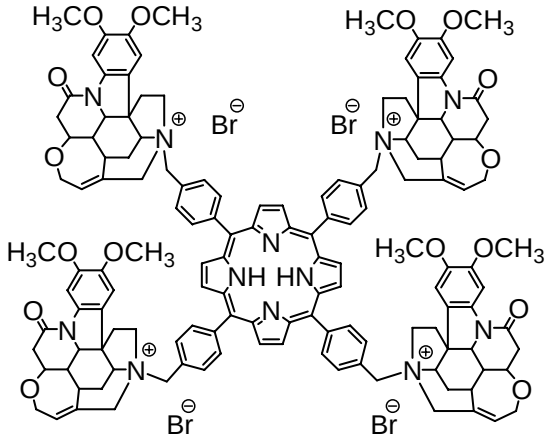
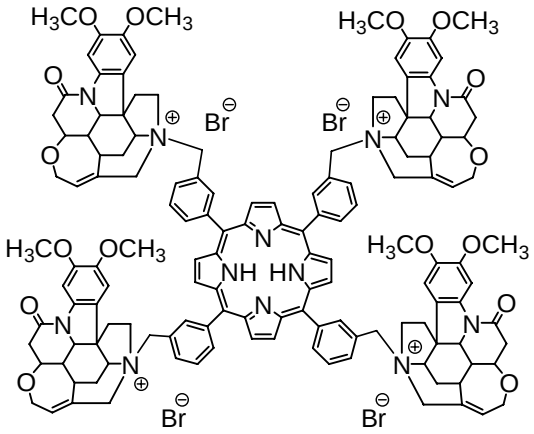
Figures:



para-porphyrin-brucine conjugate



meta-porphyrin-brucine conjugate