The cationic polymer colloids with \textit{n}-hexadecyl group as catalytic media for the hydrolysis of paraoxon

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During the past few decades, micelles, microemulsions and polymer colloids have been employed successfully as catalytic media for the hydrolytic decontamination of toxic organophosphate esters which are widely used as insecticides and are stockpiled as chemical warfare agents [1-5]. In this study, we aimed to develop an efficient colloidal (latex) catalyst system based on \textit{o}-iodosobenzoate (IBA) nucleophile bound polymer colloids with \textit{n}-hexadecyl group on their quaternary ammonium ions for the hydrolysis of diethyl \textit{p}-nitrophenyl phosphate (paraoxon). For this purpose, a series of cationic polymer colloids (QL) were prepared via emulsion polymerization of vinylbenzyl chloride followed by treatment with \textit{N},\textit{N}-dimethylhexadecylamine in order to provide binding site and support for the negatively charged IBA and create organic media with micelle-like surface in continuous aqueous phase. The surface of resulting polymer colloids mimics the micelles of a cationic surfactant like hexadecyltrimethylammonium chloride (CTACl) which has been mostly used as a micellar medium in the hydrolysis of paraoxon and some other organophosphate esters [1].

During the hydrolysis of paraoxon, the rates were monitored by following the absorbance of released \textit{p}-nitrophenoxide (NP) ion at 400 nm in the reaction medium. Based on obtained kinetic data, amounts of less than 0.5 mg mL\textsuperscript{-1} of the cationic colloids increased the rate of \textit{o}-iodosobenzoate-catalyzed hydrolysis of paraoxon up to 9900 times that of the reaction carried out in the absence of the colloid at pH 8.0. These rate enhancements in cationic colloidal media are as high or higher than in IBA-CTACl micellar catalysis system [1] and also the activity persists at very low colloidal particle concentrations, while surfactants have high catalytic activity only above the critical micelle concentrations.

![Chemical structure of IBA/QL catalyzed hydrolysis of paraoxon](image)