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Exposure of activated sludge to nanosilver and silver ion: Inhibitory effects and binding to the fractions of Extracellular Polymeric Substances

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Abstract

The main aim of the study was to determine the inhibitory effects of Ag^+ and AgNP (commercial and synthesized) on activated sludge by using respirometry. Along with this aim, also the changes taking place in extracellular polymeric substances (EPS) were studied. Additionally, the binding of Ag^+ or AgNP to the different fractions in EPS was assessed using voltammetry. Synthesized AgNP led to an obvious inhibition whereas commercial AgNP had no effect on activated sludge. For Ag^+ and AgNP, IC_{50} values were found between 2.3-3.0 mg/L and 3.2-11.1 mg/L, respectively. Thus, AgNP was less inhibitory than silver ion, since the release of free silver from AgNP was very small. The protein and carbohydrate content of EPS was generally increased when Ag^+ was added. Both tightly- and loosely bound fractions in EPS could bind Ag^+

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