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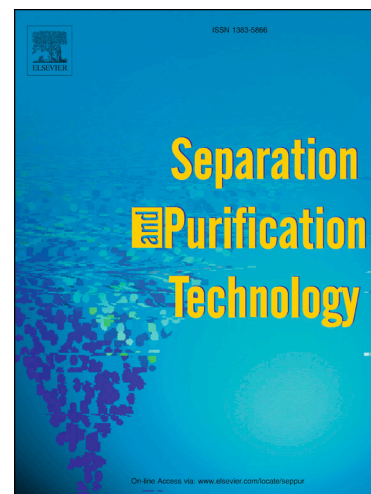
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## Investigation of effect of electric field on silver nanoparticles in order to separation of them from aqueous medium using electrocoagulation process

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### Abstract

The behavior of silver nanoparticles (AgNPs) under an applied electric field depends primarily on their stabilizing agent. This research aimed at investigating the behavior of AgNPs and their stabilizers under the electrocoagulation (EC) process. In two separate experiments, sodium citrate and polyvinylpyrrolidone (PVP) were used as the nanoparticles' stabilizers. Stability of the particles was studied while applying an electrical current with various voltages. Efficiency of the EC process was investigated for these different AgNPs sols. In the case of sodium citrate for various voltages, the plasmon resonance peak of the sample was disappeared after applying the electric field for 90 min, reflecting the removal of AgNPs in the sol by 99.91%. In the case of PVP for various voltages of the EC process for 10 min, the absorbance peak disappeared, and removal efficiency of AgNPs reached 99.98%. Effect of stabilizer concentration on the EC process was investigated. As sodium citrate concentration increased, the stability of AgNPs under an equal applied electric field increased, while the increase of the PVP concentration did not influence on the stability of AgNPs. Kinetic of AgNPs removal was also studied.

**Keywords:** AgNPs, Sodium citrate, PVP, Stabilizer, Electrocoagulation

### 1. Introduction

Nanotechnology, the designing and engineering of materials with at least one dimension less than 100 nm with specific chemical and physical properties, has opened up a tremendous field of new applications beneficial to humanity and the environment [1]. In this regard, AgNPs have attracted attention of many researchers due to their unique properties such as catalytic, antibacterial and particularly good conductivity effects [1, 2]. Nowadays, AgNPs synthesis is done using various stabilizing agents. There are differences between AgNPs stabilized using different stabilizers, e.g. in terms of their stability, morphology, size etc. [3, 4]. Therefore, the behavior of AgNPs synthesized using various stabilizers can vary under the effect of electric field. The electric field can be applied using the electrocoagulation process.

In recent years, EC technology, as an electrochemical method, has attracted significant attention for treatment of water and wastewaters [5]. The apparatus used in this technology contains at

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