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ANALYTICAL CAPABILITIES OF TOTAL REFLECTION X-RAY FLUORESCENCE SPECTROMETRY FOR SILVER NANOPARTICLES DETERMINATION IN SOIL ADSORPTION STUDIES

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ABSTRACT

In recent years, the production of silver nanoparticles (AgNPs) has grown due to their antibacterial properties. This fact enhances the release of these particles into the environment, especially in soils that are the major sink. To better understand adsorption processes in soils, usually batch kinetic studies are carried out. In this context, we tested the possibilities of using total reflection X-ray fluorescence spectrometry (TXRF) to monitor the silver content in soil adsorption kinetic studies. It was found that the lower limit of detection for Ag (through Ag-K_α detection) in aqueous solutions was around 37 $\mu g \cdot L^{-1}$, which was suitable to carry out this kind of studies. Moreover, was investigated the direct analysis of Ag adsorbed onto soil after the kinetic studies. In this case, the limit of detection for Ag was around 1.7 $mg \cdot kg^{-1}$. All TXRF results were compared with those obtained by inductively coupled plasma optic emission spectrometry and good agreement was found. The batch adsorption tests performed showed that 98% of polyvinylpyrrolidone coated AgNPs were retained on the tested soils in less than 6 hours.

Keywords: Silver nanoparticles, Soils, Sorption study, Total reflection X-ray spectrometry, Suspension

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