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SILICA WITH IMMOBILIZED PROPYLTHIOETHYLEAMINE AS AN ADSORBENT FOR SELECTIVE DETERMINATION OF GOLD, PALLADIUM AND SILVER

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Noble metals, particularly palladium, gold and silver, find an extensive use in the electrical industry, medical and jeweller industry. All these metals are very important elements for utilization and particularly from secondary sources since Ukraine has no deposits. One form possible sources is wastewater from non-ferrous metals industry.

The direct application of flame atomic absorption spectrometry to the detection of noble metals in complex matrices such as wastewater, geological and environmental samples is limited by numerous interferences, both mutual and those from associated base metals. For instance, base elements, i.e. zinc, copper, nickel and other, interfere on the signals atomic absorption determination of precious metals. Therefore, low concentrations of noble metals a separation/pre-concentration procedure prior to detection is required. For this purpose solvent extraction and solid phase extraction techniques (SPE) have been widely used. SPE has found increasing application for preconcentration of noble metals.

In the present study, silica with covalently immobilized propylthioethyleamine ($SN\text{-}SiO_2$) was used as SPE for selective pre-concentration of trace amount of palladium from wastewater, silver from solution of electrical contact and gold in acid-treated integral microcircuit. A pre-concentration method is based on adsorption of Pd^{2+}, Au^{3+} and Ag^{+} on modified silica due to complex formation with immobilized organic ligand, followed by eluted and further determination by atomic-absorption technique.

In this study, various parameters, i.e. pH, time of stirring, volume of sample, chooses eluents and adsorption isotherm of silica gel has been studied. The influence of interfering elements in analyzed solutions on Pd, Au and Ag determination was investigated by using the development method. The results showed that up to 100 $\mu g\ ml^{-1} Pb^{2+}$, 1000$\mu g\ ml^{-1} Cu^{2+}$ did not interfere with the palladium, silver and gold signal. The results obtained are demonstrated that $SN\text{-}SiO_2$ can be used for selective pre-concentration of mentioned noble metals from very complex solutions. The method has been successfully applied to the analysis with detection limit 0.02 $\mu g\ ml^{-1}$, 0.01 $\mu g\ ml^{-1}$ and 0.05 $\mu g\ ml^{-1}$ of Ag, Au and Pd respectively.