

Development of solvent extraction system with a new synthesized ligand of highly extractability and selectivity for palladium from aqueous waste solution

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The increasing concern towards protection of the environment, energy saving and optimization of a wide range of industrial processes imposes the need for development of advanced separation techniques in particular for liquid waste and effluents. Recently, the separation of precious metals has become very important due to rapidly growing demand of the metals in the field of electronic devices, autocatalysis, etc. Nowadays, various ligands have been developed for this purpose. However, these ligands suffer several limitations like slow kinetics of extraction, low solubility, poor decontamination factor, pH sensitivity and instability in acidic medium. It is already known that amidic extractant like malonamides (MA) and diglycolamide (DGA) when used in higher concentrations can extract palladium from nitric acid medium with simultaneous co-extraction of other metal ions. Sulphur analogue of diglycolamide (TDGA) has been also used for PGMs extraction. However, high selectivity and extractability of these ligand was attributed the presence of thio-etheric sulfur and amidic moiety appropriately placed in ligand to chelate through more than one donor sites. In the present work, a new dithiodiglycolamides (DTDGA), namely, N,N,N',N'-tetra-n-octyl-dithiodiglycolamide (TODTDGA), has been synthesized and studied for their extraction behavior towards Pd(II), Pt(IV), Rh(III), Cu(II), Ni(II), and Fe(III) from hydrochloric acid medium. All results were compared with those obtained by using N,N,N',N'-tetra-n-octyl-thiodiglycolamide (TOTDGA), which contain one thio-etheric sulfur. Extraction equilibrium studies showed complete extraction of palladium within 5 minutes. A systematic liquid-liquid extraction investigations has been carried out to understand the influence of various parameters on the extraction behavior of Pd(II). The main extracted species of Pd(II) was found to be PdCl₂.DTDGA, and IR spectra of the extracted species have been also investigated. The synthesized dithiodiglycolamides (TODTDGA) showed great extractability and selectivity for palladium than the other investigated metal ions. Pd(II) was found to be easily separated from other investigated metal ions in a single extraction step.