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Protocol for solvent extraction experiments applied to nickel, cobalt and neodymium

Recycling of precious metals and rare earths notably from electronic scrap is an attractive prospect. Such scrap is available in Europe and rich in those metals. However, the metals need to be separated from each other. To achieve this, a sequence of scrap comminution, acid leaching and solvent extraction is commonly put forward.

Solvent extraction process is specific to the metal extracted. To design processes, the development of numerical models is important, but it requires experimental parameters fitting for the system studied. For this purpose, standardized lab experiments must be conducted.

This aim of this work is to establish protocols for two kinds of solvent extraction experiments. The first is solvent extraction in shaken tubes. The extraction equilibrium is determined for a given *p*H based on this protocol. Several extraction experiments allow to determine the stoichiometry and equilibrium constant of the extraction reaction. The second experiment is dedicated to mass-transfer kinetics in a single-drop cell. The extractant organic solution is introduced dropwise in the equipment and maintained in contact with the metal aqueous solution for a determined residence time. With data points obtained for different residence times, the mass transfer rate is obtained for the system.

To measure metal concentration in aqueous phase, spectrophotometry is used in this work. The accuracy of the measurements is evaluated by comparing this work's results with results from literature. The protocol is first tested out on nickel and cobalt extraction, two metals well-known in the literature, then on the less-studied rare earth metal neodymium.

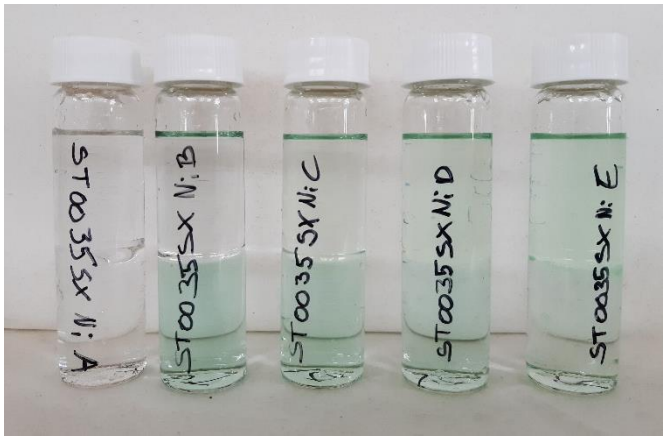

Figure 0-2: Extraction tubes of nickel with D2EHPA

Figure 0-1: Single-drop cell