



Extraction of tungsten(VI) using a
coconut oil based ligand

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ABSTRACT

This study is one of a series of research studies on the feasibility of extracting metals using disubstituted hydroxylamine ligands derived from locally available inexpensive oils. The ligand used in this study was synthesized using coconut oil as the starting material. The ligand was found to dissolve freely in n-hexane (b.p. 69°C).

The extraction studies carried out using the ligand showed that it is capable of extracting over 90% of tungsten(VI) from 1M hydrochloric acid solutions into a 0.1% hexane solution of the ligand. The percentage extraction was found to be virtually unaltered by the ionic strength of the medium in the pH range 1.0 to 5.0. As the acidity is increased a second maximum was observed in 8.5M hydrochloric acid medium. The percentage extraction at this point was 85%. Hydrochloric acid was found to be the most favourable acid to maintain the acidity of the medium.

Over 46% of molybdenum(VI) could be extracted from 1M hydrochloric acid solutions using 0.1% ligand solutions. The percentage extraction is increased to 60% in 4.3M hydrochloric acid medium and become zero in 8.5M hydrochloric acid medium. The ionic strength of the medium has no effect on the extraction in the pH range 1.0 to 5.0.

As molybdenum is one of the most common impurities encountered when extracting tungsten from its ores, an attempt was made to extract tungsten(VI) selectively from a mixture of tungsten(VI) and molybdenum(VI) in 8.5M hydrochloric acid solutions. Although the individual extraction curves of tungsten(VI) and molybdenum(VI) showed that the percentages of extraction are 85.0% and 0.1% respectively at this acidity, an extraction of a mixed species containing tungsten(VI), molybdenum(VI) and the ligand was observed when applied to a mixture of the two ions. The structure of the mixed species is postulated.

Both tungsten(VI) and molybdenum(VI) could be selectively extracted from a solution maintained at pH 0.4 containing a large excess of iron(III), aluminium, phosphate and fluoride.

More than 95% of the extracted tungsten(VI) could be stripped into the aqueous phase by contacting with a 2M sodium hydroxide solution. The ligand could also be recovered at the same time as it was found to be precipitated out as a third layer.

