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Extractive separation of vanadium (v) and molybdenum (VI) from simulated 6M HCl solution with trioctyl phosphine oxide (TOPO)

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The extractive separation of vanadium (V) and molybdenum (VI) from 6.0 mol dm-^{3} HCI in the presence of 0.1 mol dm-^{3} KCI as a salting -out agent using trioctyl phosphine oxide (TOPO) IN n-heptane has been investigated. Equilibrations were performed at optimal contact time of 5 min. The V (V) and Mo (VI) ions were determined spectrophotometrically by the phosphotungstate and thiocyanate methods respectively. From their individual synthetic solutions, the effect of increasing concentration of TOPO in the range 0.013-0.065moldm-^{3} to enhance a selective extraction, proved inefficient. This is because both ions were substantially extracted with percentage V(V) extraction (E%) optimized at 90.0% while Mo(VI) was 95.0%, with both observed at a concentration of 0.52 mol dm-^{3} TOPO. This was reflected in the low separation factor( ) of the range 1.8-2.1. For the synthetic simulated mixture of the metals in 6.0 mol dm-^{3} HCl, parameters such as the effect of concentration of TOPO and organic to aqueous phase volume ratio (1:1- 4:1) on the percentage of the metal extracted or stripped was examined. The optimal separation of V(V) and Mo(VI) was achieved by selective stripping with percentage of V(V) and Mo(VI) stripped (separately) after two stages being 99.0 and 99.8% respectively. In this process we used 2.0 mol dm-^{3} H_2SO_4 and 14.5 mol dm-^{3} NH_3 in that order, at organic to aqueous phase volume ratio (1:1 to 4:1). It decreased the percentage of the metals co-extracted and hence that available for stripping (E% of V(V) decreased from 90.0 to 75.0% and for Mo(VI) 96.0 to 57.1% for a single stage stripping. From the slope and spectral analysis , the stoichiometries of the composition of the organic phase were formulated as $VO_2Cl._2$TOPO and MoO_2Cl_2. TOPO.

Biography

James O Ojo is skilled in the area of extractive metallurgy with strong passion for vanadium and molybdenum. His impressive output emanated from the many years of research and teaching on the aqueous chemistry of these metals, thus the versatility in the utilization of various extractants, including trioctyl phosphine oxide, and many other ligands for the extractive separation of these uncommonly associated metals. His ultimate interest, as well as success, is in the devising of simple extractive separation routes for co-polymerizing metals (from admixtures) such as vanadium and molybdenum, with vast applications in hydrometallurgy, recycling and routine analysis. This approach will eventually impart finesse to the metallurgical and recycling processes of several versatile metals.

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