

Recovery of Vanadium as a By-product in the Processing of Carnotite in Calcrete Ores

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ABSTRACT

Vanadium, used in high-strength steel and also in some battery applications, is found alongside uranium in carnotite ores and has historically been produced as a by-product in some operations. Increasing demand for vanadium, coupled with production cuts, is offering some uranium producers a possible route to improve project economics at a time of low uranium prices. At present only one uranium mill, Energy Fuels' White Mesa operation, is producing vanadium, which is recovered from pond return liquor. The pond liquor contains dissolved vanadium not recovered from previous processing activities. White Mesa has historically recovered both uranium and vanadium from ores by acid leaching and solvent extraction.

More recently, a number of companies, including Paladin Energy, Aura Energy, U3O8 Corp, Blue Sky Uranium, investigating carbonate leaching of carnotite ores, have indicated the potential for the recovery of vanadium as a by-product. While vanadium in carnotite ($K_2(UO_2)_2(VO_4)_2 \cdot 3H_2O$) would be expected to display similar leaching behaviour to uranium, the vanadium content of many carnotite-in-calcrete ores is greater than would be expected from the U/V ratio in carnotite, indicating the presence of other vanadium minerals.

This paper examines the impact of carbonate leaching conditions on uranium and vanadium extraction from a range of carnotite-in-calcrete ores, and relates the vanadium extraction as a function of the different vanadium minerals in the ores. The findings are particularly relevant to developing projects as results show that an elevated vanadium content in ore does necessarily equate to a high vanadium extraction in leach.

As vanadium has not been recovered from alkaline leach liquors in uranium operations, flowsheet options for recovery of uranium and vanadium from solution via ion exchange are also briefly discussed.