RADIUM BALANCE STUDIES
AT THE BEAVERLODGE MILL

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The objective of these studies was to determine the course taken by Ra-226 in the Beaverlodge Mill circuit. The results obtained show that the dissolved portion of radium at any station is small relative to the total radium in the system (<1.5%) and hence the containment of radium from solutions within the Beaverlodge Mill circuit is not practical. In the Dorrclone Plant, treatment of the bulk tailings segregates the fine -75 μm fraction. The Dorrclone overflow which contains most of the radium (>83%) is discharged to the tailings treatment system.

Introduction

Due to the relatively high carbonate (≈5%) and low sulfide (≈1%) contents of the pitchblende-bearing ore, an alkaline leach process was chosen for uranium extraction at the Beaverlodge Mill.1 The ore is leached in a hot sodium carbonate/bicarbonate solution, and oxidised by the direct addition of oxygen to the leach Pachucas. Uranium is precipitated from the leach solution as sodium diuranate. A schematic diagram of the milling process is shown in Fig. 1.

One significant waste disposal problem for Eldorado, like other companies in the uranium mining industry, is the need for controls over the release of radioactive materials such as Ra-226, either dissolved or in solid form, into the surrounding eco-system. It has been shown by various workers that most of the radium in the ore reports in the tailings.2–5 This could mean either radium present in the ore is not leached and possibly present within the crystal lattice, or is leached and reprecipitated at a certain stage in the mill circuit. Control of radium leaching from tailings will depend on the nature of radium present in the tailings, in the precipitate or in the ore itself. If radium is leached and reprecipitated, then testwork on topics such as leaching and precipitation kinetics, flocculation and settling rates should prove to be useful.

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The possibility of radium being leached in the mill circuit and reprecipitated is indicated by analysis of the radium of yellow cake obtained from Beaverlodge, before and after the lime circuit was introduced. Radium in yellow cake before and after the introduction of the lime circuit were 1000 pCi/g and 50–80 pCi/g, respectively. This may be due to the absorption of radium by precipitated calcium salts. Percolation leach studies on Beaverlodge tailings using rainwater have shown that the redissolution of radium does take place. This fact, therefore, precludes the possibility of all the radium being held in a crystal lattice in Beaverlodge type ore tailings.

Hence, a systematic investigation was undertaken on the Beaverlodge mill to study the fate of radium as it passes through the circuit.