

# Processing of Ore from the Angularli Deposit, Alligator River Region, Northern Territory

*M. Maley<sup>1</sup>, R. Ring<sup>2</sup> and X. Moreau<sup>3</sup>*

1. Senior Hydrometallurgist, ANSTO, Lucas Heights, NSW, 2234. [mkm@ansto.gov.au](mailto:mkm@ansto.gov.au)
2. Principal Consultant, ANSTO, Lucas Heights, NSW, 2234. [bjr@ansto.gov.au](mailto:bjr@ansto.gov.au)
3. General Manager – Geology and Exploration, Vimy Resources, West Perth, WA, 6005. [xmoreau@vimyresources.com.au](mailto:xmoreau@vimyresources.com.au)

## ABSTRACT

In March 2018 Vimy Resources announced the acquisition of the Alligator River Project in Arnhem Land, Northern Territory, completed in July of that year. This project comprises three separate tenement packages. One of these tenements, the King River-Wellington Range project, is held in a Joint Venture with Rio Tinto Exploration (75% Vimy / 25% Rio Tinto) and contains the Angularli Deposit. Vimy subsequently announced a maiden Inferred Mineral Resource for Angularli of 25.9 Mlbs U<sub>3</sub>O<sub>8</sub> for 0.91 Mt ore at 1.29% U<sub>3</sub>O<sub>8</sub>, at a cut-off grade of 0.15% U<sub>3</sub>O<sub>8</sub>.

To support a Scoping Study on the Angularli deposit, ANSTO undertook a work program using historical drillcore samples to examine the mineralogy of the mineralised and gangue material, and perform a preliminary assessment of the processing characteristics of the ore, and to benchmark the ore against historical data for previously mined uranium deposits in the Alligator River area, such as Nabarlek.

Mineralogical analysis of a composite sample containing 0.74% U<sub>3</sub>O<sub>8</sub> (matching an expected diluted mine grade) showed that the predominant uranium mineral was coffinite, with less amounts of uraninite and minor brannerite and uranophane. Leaching tests performed consistently achieved uranium of extractions of >98%. The optimum conditions identified for leaching were pH 1.6, ORP 480 mV, 40°C and a slurry density of 50 wt%. Under these conditions a uranium extraction of 98.6% was achieved (102 ppm U<sub>3</sub>O<sub>8</sub> residue grade), with an acid addition of 14.9 kg/t and a hydrogen peroxide addition of 1.2 kg/t.

Solvent extraction (SX) test work was performed using a typical solvent composition. The tests showed that with three stages, a loaded solvent containing 7.0 g/L U<sub>3</sub>O<sub>8</sub> could be produced with raffinate containing <10 mg/L U<sub>3</sub>O<sub>8</sub> (>99% extraction). Stripping tests using 4 M sulphuric acid showed that a loaded strip solution containing 100 g/L U<sub>3</sub>O<sub>8</sub> could be readily produced, with no significant impurities.

As the uranium tenor of the pregnant leach solution (PLS) was sufficiently high and impurities low, the option of direct precipitation of UO<sub>4</sub> from the PLS was also investigated. Following iron precipitation, uranium precipitation achieved a 99.8% recovery, with the UO<sub>4</sub> product meeting converter specifications.

The results from the testwork program show that the Angularli ore is highly amenable to conventional processing techniques, with very high uranium extraction and low reagent consumptions, lower than those for Nabarlek, meaning that the project economics would likely be very positive. The application of direct precipitation would likely reduce the costs and simplify the flowsheet as no SX stage would be required.