



LABORATORY TESTWORK TO SUPPORT THE DEVELOPMENT OF URANIUM ISR OPERATIONS

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ABSTRACT

Thorough hydrometallurgical testwork, including extensive mineralogical characterisation, is a critical aspect in the evaluation and development of uranium ISR operations. An understanding of the uranium and gangue mineralogy of the ore allows the appropriate leaching system (acid or alkaline) to be evaluated based on the presence of acid consuming phases such as carbonate minerals. Similarly, the potential oxidant requirement can also be assessed by the content of reactive sulphides and other reducing phases in the ore. In addition, the presence of other phases such as gypsum, which results in carbonate consumption, and clays and organic phases, which can adsorb dissolved uranium, can be deleterious.

ANSTO Minerals (AM) has worked with numerous clients over 30 years to perform all aspects of metallurgical testwork in the ISR field, from the evaluation of prospective ISR deposits to supporting existing operations. In this time the group has developed an extensive suite of tests and techniques for the testing of ores in their amenability to ISR, often utilising the relatively small amount of sample available. This includes the use of conventional stirred tank and bottle roll tests to obtain preliminary reagent consumption data and provide indicative uranium extraction.

More accurate data, including the relative rates of uranium leaching as well as the anticipated final extraction, can be obtained from horizontal column leaching tests. AM has performed numerous ISR column leaching studies in acid systems to evaluate the effect of varying leach conditions and ore types on uranium extraction. Pressurised column tests, simulating alkaline ISR leaching under oxidising conditions, have also been successfully performed.

In addition to bottle roll, stirred tank and column tests, AM has also developed more non-conventional tests to evaluate the effect of varying leach conditions on uranium and gangue extraction with a limited amount of sample. These include diagnostic leach tests, to determine the maximum uranium extraction under a given set of conditions, and also autoclave tests to simulate oxidative alkaline leaching.

This paper will present an overview of the work performed by AM in the area of ISR, and present key results from various testwork programs performed. This metallurgical work complements the other important work critical to the evaluation of ISR operations, such hydrogeological studies.

Keywords: Uranium Leaching, ISR, Hydrometallurgical Testwork, Mineralogy