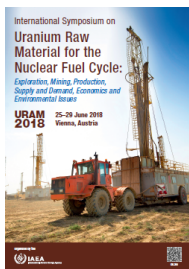


# International Symposium on Uranium Raw Material for the Nuclear Fuel Cycle: Exploration, Mining, Production, Supply and Demand, Economics and Environmental Issues (URAM-2018)



Contribution ID: 140

Type: ORAL

## Selective Leaching of Uranium from Phosphates Ore

Wednesday, 27 June 2018 16:20 (20 minutes)

A leaching reagent (LR) has been successfully used (for environmental importance) to leach - (remove) - uranium from input phosphate ores prior to processing for production of phosphatic fertilizers (and phosphoric acid), without dissolution of any amount from the phosphate mineral. In (traditional) phosphate industry, rock phosphate is digested with sulfuric acid for production of phosphoric acid and phosphatic fertilizers. Thereupon, uranium present in rock phosphate would be transferred to the products, phosphatic fertilizers and phosphoric acid, and by-product (phosphogypsum). The uranium contaminations could enter the environment and possibly pose radiation exposure concerns through several pathways: From using fertilizers in cultivation of the agricultural lands, from using phosphogypsum as agricultural gypsum, and from using phosphogypsum as a building material. Phosphate rocks, superphosphate fertilizer and phosphogypsum contain uranium as a host of environmentally hazardous chemical element, and they contaminate the agricultural soils through the use in cultivation. Uranium apart from its radioactivity is chemo-toxic (its biochemical toxicity is estimated to be six orders of magnitude higher than the radiological toxicity), and because of these properties, it is considered as a disease causing element. Due to the extensive usage of these contaminated fertilizers, the danger posed to human health is very large. The geochemical pathways lead this toxic element (U) into food crops, soil, water, air and ultimately human body tissues via the food chain.

Therefore, removal of U from input phosphate ores prior to processing for production of phosphatic fertilizers, is considered a very important operation in order to prevent disease in humans (through healthy environments) on one hand, and obtaining the valuable U element as a source of energy on the other hand. On the other hand, in case of processing rock phosphate for phosphoric acid production (wet phosphoric acid process) without uranium removal - by our (LR) - prior to processing, practically most of the uranium present in phosphate rock ends up in solution. Present commercial recovery of uranium from phosphoric acid is based on solvent extraction methods that have the following disadvantages, namely, 1) - Solvent extraction methods are expensive, especially because of the required prepurification of the phosphoric acid in order to assist phase separation, and the subsequent treatment of the acid to prevent attack of the rubber lining of phosphoric acid evaporation equipment. These previous acid conditioning stages are associated with large investment and operation costs. 2) - The treated phosphoric acid may be contaminated with organic solvents. 3) - The economy of the process is strongly affected by the uranium concentration, because the investment and operating costs depend on the acid throughput. 4) - Recovery of uranium from phosphoric acid in combination with direct production of concentrated (>45-52% P<sub>2</sub>O<sub>5</sub>) acid, i.e., the so-called hemihydrate process (>45% P<sub>2</sub>O<sub>5</sub>) is not possible on a commercial scale using solvent extraction techniques. We attained the preferred leaching conditions of uranium from the phosphate ore (without dissolution of any amount from the phosphate mineral) after performing several series of leaching experiments under different conditions.

### Country or International Organization

Kuwait

**Primary author:** Mr AL-KHALEDI, Nahhar (KUWAIT)

**Presenter:** Mr AL-KHALEDI, Nahhar (KUWAIT)

**Session Classification:** Uranium from Unconventional Resources

**Track Classification:** Track 8. Uranium from unconventional resources