Continuing studies of the effects of gamma irradiation on a TBP process solvent*

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Abstract

Design and installation has been completed for a state-of-the-art radiolysis/hydrolysis test loop system. The system is used to evaluate the effects of gamma radiolysis and acid hydrolysis on the stability and performance of solvent extraction process solvents. In the solvent irradiation and hydrolysis loop, aqueous and organic phases are mixed and circulated through a gamma irradiator until the desired absorbed dose is achieved. Irradiation of the mixed phases is more representative of actual conditions in a solvent extraction process. Additionally, the contact of the organic phase with the aqueous phase will subject the solvent components to hydrolysis. Since all viable solvent extraction components in an advanced fuel cycle must exhibit high radiolytic and hydrolytic stability, this test loop will not be limited to any one solvent system but will be applicable to all systems of interest. The test loop is a valuable tool for fundamental research on newly identified extractants/modifiers and the impact of gamma radiation on their stability in a dynamic environment. The investigation of the radiolysis of a TBP/n-dodecane process solvent in contact with aqueous nitric acid has commenced. These studies are intended to confirm the operability of the test loop system. Initial experimental results are consistent with existing literature reports regarding TBP/n-dodecane radiolysis.

* The full paper being unavailable at the time of publication, only the abstract is included.