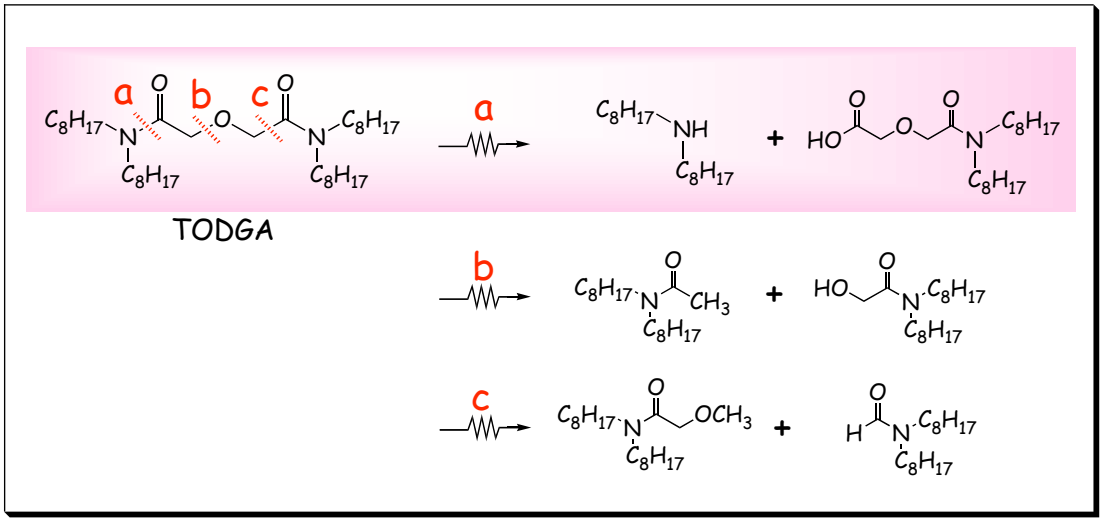
Radiolysis Study of Extractants and Adsorbents for Separation of Actinides

In order to evaluate the applicability of efficient extractants and adsorbents for the separation of actinides to the process in high radiation fields, it is an important task to investigate the radiolytic stabilities of them and the radiation effect on the separation of actinides.



This figure shows the main reaction of the radiolytic degradation of *N,N,N′,N′*-tetraoctyldiglycolamide (TODGA) by γ-rays. It was found that amide-bonds and bonds in the vicinity of ether oxygen were relatively weak against radiation. In particular, in the presence of nitric acid, the cleavage of the amide-bond (a) is dominant, and mainly dioctylamine and *N,N*-dioctyldiglycolamic acid are formed .

Furthermore, the radiation effect on the extraction of actinides was investigated using a solution of TODGA pre-irradiated with γ-rays. Good extraction at high acidity was maintained even after irradiation up to a dose corresponding to dozens of cycles in the actual process. This result suggests that there are some radiolytic degradation products contributing to the extraction of actinides.

The radiolytic stabilities of the organic extractants have been commonly evaluated by the irradiation with γ-rays as the most convenient method. However, in the actual partitioning process of HLW, the extractants will be exposed to α-particles emitted from actinides, as well as β- and γ-rays from various fission products. Since the energy deposition of α-particles is quite different from that of γ-rays, it is essential to investigate α-radiolysis of the organic extractants.

In contrast to the irradiation using actinides as α-particles emitter, the irradiation with α-particles provided by an accelerator can be carried out in a reasonable timescale without contamination with radionuclide. α-Radiolysis study is now in progress at the Takasaki Ion Accelerators for Advanced Radiation Application facility.