

Fractional Crystallization - DWPF Vitrification

The proposed process would selectively remove sodium and potassium salts from the dissolved salt / supernate feed by utilizing the solubility difference of the different salts in the neutralized waste stream. The cesium remains in the mother liquor and can be transferred to the DWPF. Prior to the crystallization step, the salt solution feed is filtered to remove the sludge solids. The filtrate is acidified with nitric acid to convert OH^- , CO_3^{2-} , and NO_2^- to NO_3^- . The acidified solution is next fed to a continuous crystallizer unit coupled to a filtering / separation device to separate the crystals from the mother liquor. The soluble radionuclides stay in the mother liquor, except for the fraction that remains occluded within the crystals or adheres to the surfaces. The mother liquor is sent directly to DWPF after pH adjustment, if necessary. The crystals are decontaminated by washing and are then dissolved and sent to Saltstone to produce a Class A waste.

Variations:

- 1) Batch crystallizer
- 2) Eliminate potassium separation

Merits:

- 1) No reagents added
- 2) Routine industrial non-radioactive operation

