HLW glasses: Radiation Stability – State of the Art.

Hj. Matzke
European Commission – Joint Research Centre
Institute for Transuranium Elements
Postfach 2340, D-76125 Karlsruhe

For the safe long-time storage of liquid radioactive (high level) waste, HLW, originating from the reprocessing of nuclear fuels, immobilization in a glass matrix, and its subsequent storage in dry underground repositories is the currently accepted concept. One of the important questions for this concept is the possible modification of the glass matrix due to radiation damage. This damage will be due to *ionization* by beta- and gamma-decay of fission products and to *atomic displacement damage* due to alpha-decay of the actinides. At the same time, large amounts of He are formed in the glass.
Research work in this field has been performed on many glass types, in many laboratories and using many techniques to study the consequences of radiation damage. Doping glasses with short-lived actinides such as Pu^{238}, Am^{241}, Cm^{242} and Cm^{244}, irradiation with energetic ions (He and heavy ions), with electrons and with gamma-rays were used to produce damage, and measurements of mechanical properties, of volume changes and of leaching due to exposure to water etc. were performed at different damage levels to quantify possible changes in the most important properties of the glasses.
The present contribution will place emphasis on the well-studied French borosilicate glass R7T7, which was tailor-made to incorporate HLW. A state-of.the-art review of damage formation in HLW glasses will be given showing that no significant negative effects of damage formation for long-time storage are to be expected up to damage levels corresponding to ~ 10^5 years of storage of a HLW glass with normal reprocessing waste.