



Contribution ID: 40

Type: Poster

Study of gas generation in real L/ILW containers

Thursday, 22 April 2010 12:00 (20 minutes)

To obtain reliable estimates of the quantities and rates of the gas production in L/ILW a series of measurements was carried in the last seven years in Hungary. Drums filled with selected original L/ILW coming from the light water PWR type Paks Nuclear Power Plant (Hungary) were placed into special hermetic containers and its gas generation was measured carefully. Headspace gas analysis of real radioactive waste vaults closed between 1979 and 1995 in a near surface L/ILW disposal facility of Hungary was also carried out. It was clearly indicated that the gas generation rate is relatively high in the L/ILW drums independently the chemical type of the main components of the stored waste. Our results showed that the main generated gases in L/ILW are carbon-dioxide, methane and hydrogen. The typical rates were 0.05-0.2 STP litre gas/day for CO₂ and CH₄ generation, and less than 0.02 STP litre gas/day for H₂. No explosive gas mixture was indicated in the L/ILW drums during the investigated storage period. Compositions of headspace gases in closed L/ILW vaults were in good agreement with gas generation processes observed in L/ILW drums. The stable carbon isotope measurements show that the main source of the CO₂ gas is the degradation of organic matter in the waste. The low ¹³C content indicates microbial degradation processes as the main sources of CH₄ in the headspace gas. Typical tritium activity concentrations were between 0.1 and 10 Bq/liter gas in the drums and between 10 and 1000 Bq/liter gas in the vaults. Typical C-14 activity values of the headspace gases were between 0.1 and 2.0 Bq/liter gas in the drums and 10 and 1000 Bq/liter gas in the studied vaults.

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Session Classification: Poster Session - Chemistry of Nuclear Fuel Cycle, Nuclear Waste Management

Track Classification: Chemistry of Nuclear Fuel Cycle, Radiochemical Problems in Nuclear Waste Management