Characterization of Radioactive Wastes

ZHANG Zhentao

China Institute of Atomic Energy

International Atomic Energy Agency Scientific Forum

RADIOACTIVE WASTE: MEETING THE CHALLENGE

Science and Technology for
Safe and Sustainable Solutions

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1. Waste Characterization for Classification

➤**In-Drum Gamma Methds**
●**High Level Wastes**
●**Low and Intermediate Wastes**
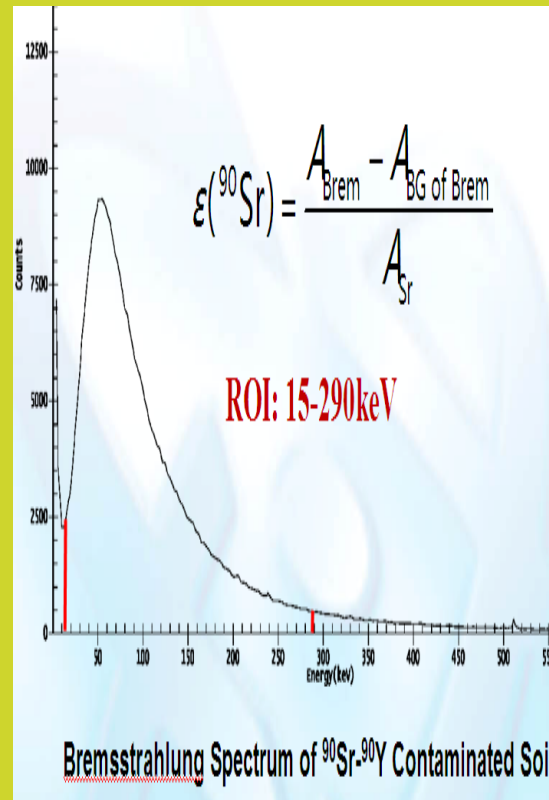
➤**In-Drum Neutron Methods**
●**α Wastes**
●**Non α Wastes**

1. Waste Characterization for Classification

Difficult-to-Measure Radionuclides

➢**Scale Factor Method for NPP wastes**
Ratio of DTM Radionuclide (e.g. ^{90}Sr,^{63}Ni) to ETM Radionuclide (e.g. ^{137}Cs, ^{60}Co)
➢**Direct Measure Technique**

$$\varepsilon(^{90}Sr) = \frac{A_{Brem} - A_{BG\ of\ Brem}}{A_{Sr}}$$

ROI: 15-290keV

Bremsstrahlung Spectrum of ^{90}Sr-^{90}Y Contaminated Soil

2. Waste Characterization for Treatment

Radionuclide Distribution in Process Streams

➢ **Gamma Spectrometer**

➢ **Alpha Spectromter**

➢ **Scintilators**

Plastic Scintilator for ^{90}Sr

Radionuclide Spectrometers

2. Waste Characterization for Treatment

Sub-Process Streams Characterization

Fluidity of Cement Paste   **Viscosity of Glass Melt**   **Homogeneity**

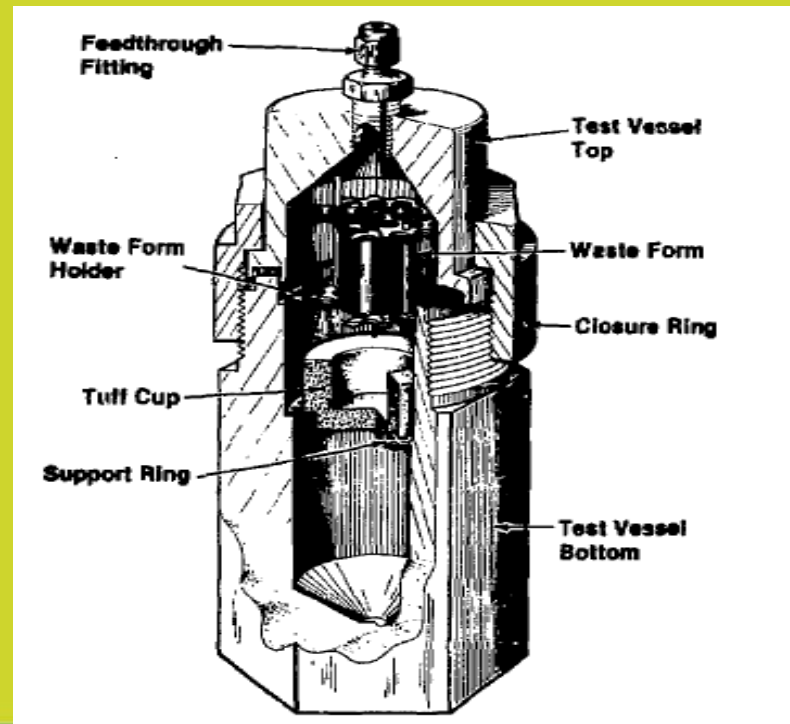# 2. Waste Characterization for Treatment

Characterization for the Wasteform

- ➢ **Leaching Resistances**

- ➢ **Radiation Resistance**

- ➢ **Thermal Properties**
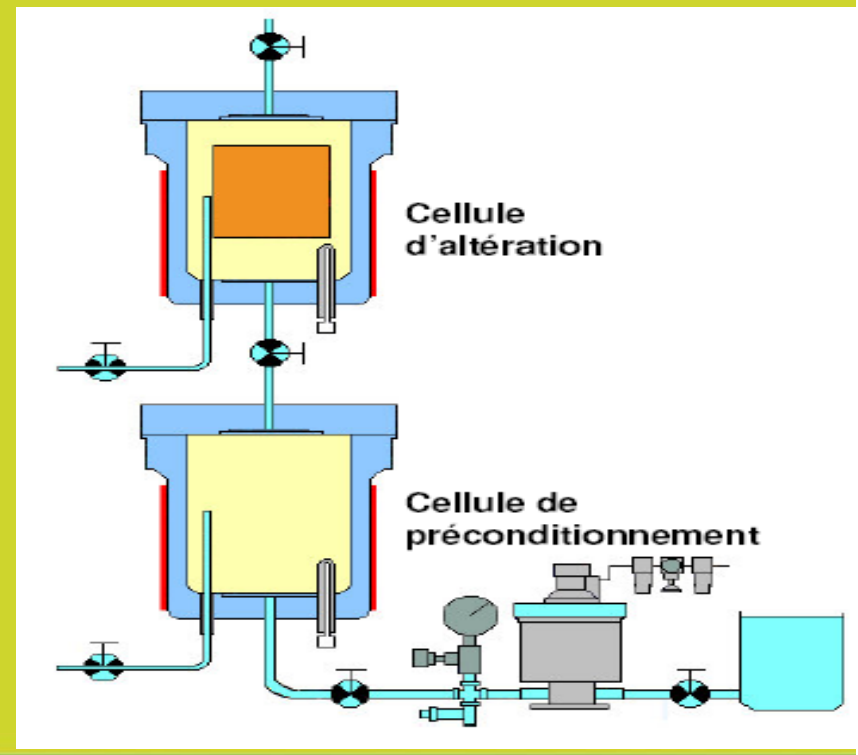
- ➢ **Mechanical Properties**

3. Waste Characterization for Disposal

Fundamental Study in Lab

- ➢ **Dynamic Mode**
- ➢ **Static Mode**

Feedthrough Fitting

Test Vessel Top

Waste Form Holder

Waste Form

Closure Ring

Tuff Cup

Support Ring

Test Vessel Bottom

Cellule d'altération
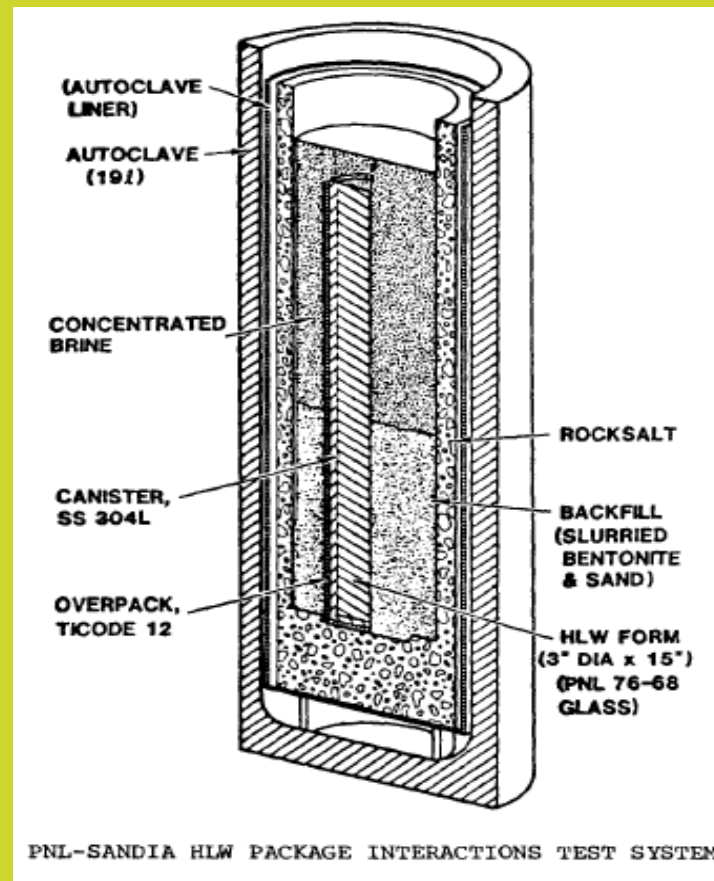
Cellule de préconditionnement
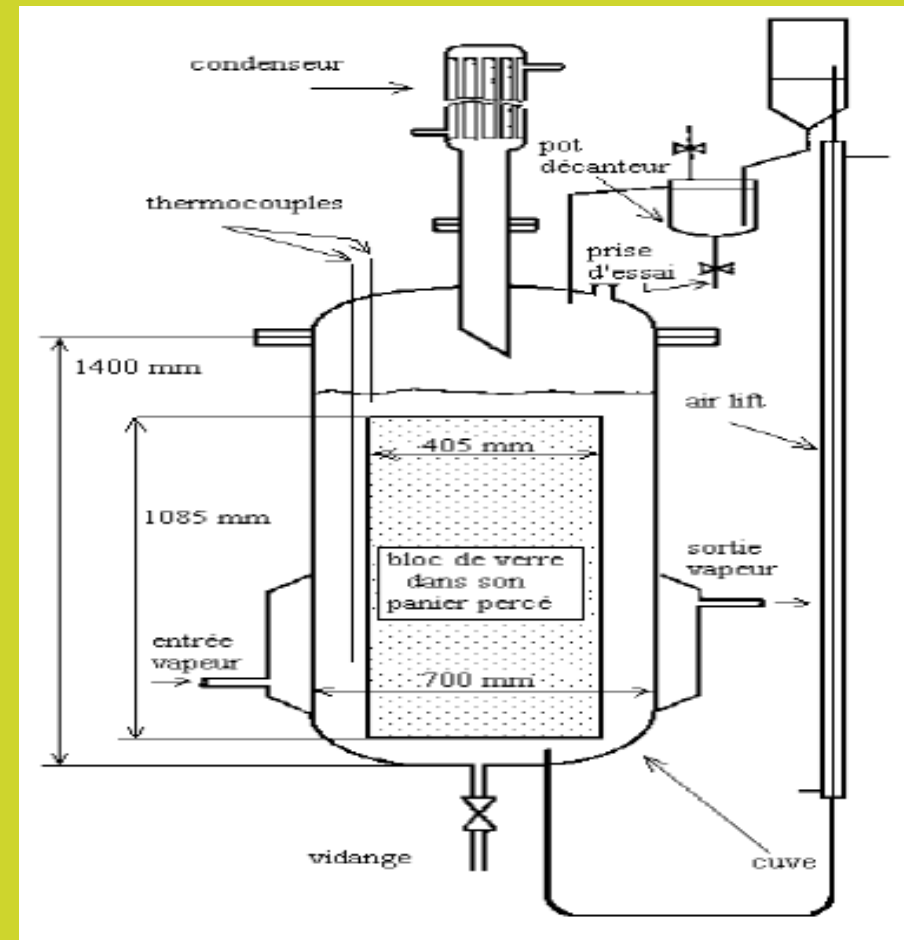
US Unsaturated Dispsal Test

France Multi-BarrierTVA

3. Waste Characterization for Disposal

Pilot Facility For Simulating Repository

US Intermediate Facilty

France Full Scale Facilty

3. Waste Characterization for Disposal

Waste Disposal Behaviour in underground Lab
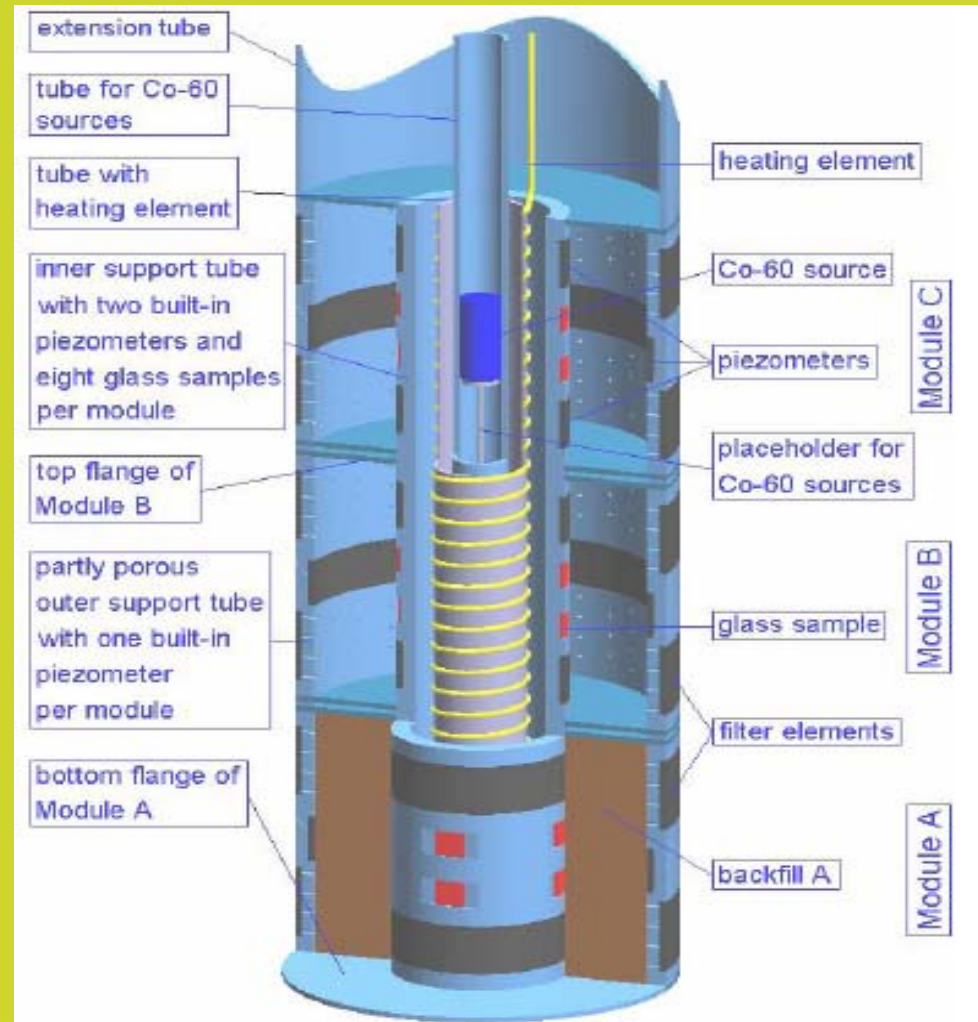
➢ **Simulating the Undergound Repository**

● **Multi-barriers**

● **Multi-parameters**

➢ **Measuring Waste Degradation Evolution**

● **Leaching of Radionuclide**

● **Alteration of Waste**

extension tube

tube for Co-60 sources

tube with heating element

inner support tube with two built-in piezometers and eight glass samples per module

top flange of Module B

partly porous outer support tube with one built-in piezometer per module

bottom flange of Module A

heating element

Co-60 source

piezometers

placeholder for Co-60 sources

glass sample

filter elements

backfill A

Module C

Module B

Module A

SCK-CEN Facility for Glass Disposal

Thank you

for Your Attention