Appendix 4: CHINA (a)

Performance of backfill materials in near surface disposal facilities for low and intermediate level radwaste

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Backfill material is an important component of a multi-barriered disposal facility for low and intermediate level radioactive waste. This appendix describes the work concerning "performance study on engineering materials of shallow land disposal of low and intermediate level radwaste".

At the time of the CRP, China had planned to establish five regional disposal sites for low-and-intermediate level radioactive waste. According to the potential distribution of these sites, forty-three sampling points were selected through information survey and table discussion. After field survey and screening, eight of them were selected for further studies in laboratory. Basic physical and chemical properties of each sample were measured in laboratory. The results indicate that no one of the samples can individually function as the backfill material in a multi-barriered near surface facility. Then nine additives for adsorption modification were tested using a static method.

Further adsorption tests were conducted: three additives screened out in previous experiment were evaluated using the static method. Results obtained show that the Kd values of mixtures of 90% NW-3 and 10% BC for Co-60, Cs-134 and Sr-85, compared with those of 100% NW-3, are 4.8, 4.6 and 4.7 times higher, respectively. Effects of contact time, pH of tracer solutions and radionuclide concentrations of tracer solutions on Kd values of three samples, NW-3, BC and 90% NW-3 with 10% BC, were also be evaluated using the static method. Column tests were performed to evaluate migration of Co-60, Cs-134 and Sr-85 in NW-3 columns with different densities. The column tests were carried out for 210 days. However, no breakthrough was obtained.

Long term performance of backfill materials was assessed through natural analogue (see also Appendix 5). We compared Chinese ancient tombs with near-surface low and intermediate level radioactive waste (LILW) disposal facilities. Both were designed based upon multi-barrier principle. Then three backfill materials were collected from two Chinese ancient tombs in south China and an ancient architecture in northwest China and were studied in laboratories from the perspective of radioactive waste disposal in near-surface facilities. The results show that the two materials from the ancient tombs have low permeability and strong adsorption to radionuclide ^{60}Co and ^{134}Cs. The distribution coefficients of the two ancient materials for the two radionuclides were all in the order of 10^1 m^3/kg. The conclusion is that current LILW disposal option in the near surface would be effective for long term period of time, since clay materials are very effective in preventing water intrusion and retarding radionuclide release.