Vol.7, No.2, pp.77 - 86, 2019 / J. Soc. Remed. Radioact. Contam. Environ.

Review

Significance of Suppressing Alkali-aggregate Reaction of Concrete for Radioactive Contaminated Wastes Disposal

Kazuo YAMADA[1*] and Masahiro OSAKO[2]

[1]Fukushima Branch, National Institute for Environmental Studies
(10-2 Fukasaku, Miharu, Fukushima 963-7700, Japan)
[2]Center for Material Cycles and Waste Management Research, National Institute for Environmental Studies
(16-2 Onogawa, Tsukuba, Ibaraki 305-0053, Japan)

Summary

A candidate facility of final disposal for relatively highly contaminated wastes with radioactive cesium by the Fukushima-Daiichi nuclear power station accident in the off-site is a closed-type equivalent one made of reinforced concrete specified in the Wastes Disposal and Public Cleansing Act. The concrete used in this closed-type final disposal facility is assumed to have a dimension of 5 m width - 10 m length - 5 m depth with more than 35 cm thickness and to be water-tight. In general, with several reasons such as thermal stress by hydration heat of cement, drying shrinkage of concrete, reinforcing steel corrosion induced by neutralization of concrete or chloride attack from environments, sulfate and salts attack, and alkali-aggregate reaction (AAR), etc., concrete gradually cracks in long-term. Based on the mechanism of cracking by most of these phenomena, it is possible to estimate quantitatively the risk of cracking and to be suppressed by some specific countermeasures to the acceptable level for structures. However, it is difficult to estimate the expansion by AAR quantitatively and the effective duration of time of suppressing countermeasures is unknown. AAR is caused by the reaction between aggregate and alkalis in concrete and the reaction is called as alkali-silica reaction (ASR). The effectiveness of the countermeasures is assumed to be effective for general concrete structures but the effective duration of time is unclear. Moreover, academic research committees have pointed that those traditional countermeasures are not perfect in some cases. In this paper, the background of this imperfectness of present countermeasures specified by JIS is summarized and a new approach to certify the safety of concrete used for disposal facilities from the viewpoint of AAR is introduced.

Key Words: Contaminated wastes, Alkali-aggregate reaction, Concrete, Final disposal facility