(4) Nuclear waste management program (Canister)

The reprocessing of spent nuclear leaves behind high-level radioactive waste which must be stored securely.

At present, spent nuclear fuel and high-level waste are temporally stored in indors, and stored in underground tunnels after a certain period of indoor storage is under consideration.

In this case, the waste would be put into metal canisters with an additional over-pack. However, due to the heat emission, the metal of such packing is expected to suffer from crevice corrosion.

ASTM Grade 12 (Ti-0.8Ni-0.3Mo, G12), which is resistant to high temperatures and crevice corrosion, is considered to be one of the candidate materials for such over-packing although there are a number of problems to be solved before making a decision on the underground storage of radioactive waste.

Wide coils, thick plates, and thin-wall seam-welded tubes produced from a large-scale ingot of G12 were investigated as to corrosion resistance, mechanical properties, weldability and so on. It was clarified that the G12 alloy has several advantageous features: the crevice corrosion resistance of the alloy was almost equal to those of G7 and PdO/TiO_2-coated Ti, and the maximum allowable stress was able to be designed higher than that of C.P.Ti. It is expected that industrial applications of the G12 alloy will increase owing to its low cost and high durability.

G12 wide coils and thin-wall welded tubes were manufactured on a commercial production basis, and corrosion resistance, physical properties, and weldability were investigated. It was confirmed that G12 provides far superior corrosion resistance, especially crevice corrosion resistance as shown in Fig.6, to C.P.Ti and has properties close to G7 and PdO/TiO_2-coated Ti. From the viewpoint of cost, G12 is less expensive than G7 or PdO/TiO_2-coated Ti.