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Using Basalt Containers for Storage of Glassed Radioactive Waste

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The generation of a great amount of radioactive waste of various radionuclide compositions and activity levels call for the development of various methods of waste reprocessing and storage, as well as the production of new equipment and setups. Vitrification is considered to be one of the main directions for high-level waste disposal. Vitrified waste must be placed in containers meeting specific requirements. One of the most promising materials for making the containers is cast stone. The material has high radiation and corrosion resistance, waterproofness, destruction resistance at 400-500oC, and a good molding ability. Cast stone products display high strength properties and resistance to aggressive media. On the other hand, when a filled container is cooling down, the differences in the thermal expansion coefficients of glass and stone casts (the coefficients may differ by a factor of 3) inevitably lead to the appearance of strain in any parts of the contact between the container material and glass, which may provoke the cracking of both the glass unit and the container material during. Placing a ready glass unit in the container is associated with loading problems, because owing to the difficulties associated with mechanical treatment of the glass unit containing high-level waste, it is virtually impossible to ensure a precise fit of the glass unit shape and the internal space of the container. Therefore, even if all technological manipulations during the packing of vitrified waste are carried out properly, the appearance of voids or strains is inevitable due to the differences in their shapes and thermal expansion coefficients. To remove this drawback, we suggest using mineral wadding between the container walls and the glass unit. The mineral wadding is made of stone melting at 1500oC. The material has a good insulation ability in a wide temperature range, high mechanical and chemical stabilities, and compression strength. It is inflammable and does not absorb water. However, special samples having good water absorption are produced too.
Ensuring the leak tightness of the containers with vitrified radioactive waste is of great importance during waste preparation for a long-term storage. Using cast stone containers is associated with lack of tightness between the cover and the container. Towards this end, a pilot setup for sealing the containers has been developed.
Thus, the obtained results allow us to conclude that using cast stone containers lined with mineral wadding from the inside have good prospects for storage of vitrified radioactive waste.

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