Storage of Radioactive Waste in Mine Cavities

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ABSTRACT

The disposal of radioactive waste in properly located space obtained by the mining out of rock salt has many advantages: (1) salt has considerable strength so that pillars left in mining may support the roof; (2) it is impervious to the passage of water because of its plasticity and crystalline structure so that mined-out space is very dry; (3) it has a sufficiently high melting point and a comparatively high thermal conductivity so that the heat generated in radioactive wastes can be dissipated in the salt without exceeding predetermined temperature rises if care is taken to design the size, shape, and spacing of waste containers; and (4) the relative ease and low cost of mining out space specially designed for this purpose.

Laboratory experiments and field tests in a Kansas mine have shown that the thermal conductivity and diffusivity of rock salt "in situ" (0.011 cal/cm/sec/°C and 0.026 cm squared/sec at a salt temperature of 60°C) are within 10-20% of laboratory values for single crystals and that temperature rises up to 65°C in large test cavities did not upset the structural stability of the mine room, even though the floor-to-ceiling dimensions decreased by 1/2 inch at a distance of 5 feet from the cavities.

Radiation doses to be expected in an actual disposal operation will not be great enough (5x10 log 8 rad) to significantly affect the structural stability of the rooms. The major remaining uncertainty is the effect on structural stability of elevating the temperature of large areas of a mine. A theoretical and experimental investigation of this problem is currently underway.