Ain Shams University
Faculty of Science
Department of Chemistry

PHYSICO–CHEMICAL STUDIES OF PROBLEMS ENCOUNTERED IN TRITIUM WASTE MANAGEMENT

Submitted to faculty of science, Ain Shams University in partial fulfillment for the degree of M. Sc. in chemistry

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ABSTRACT

Tritium (^{3}H) is the radioactive isotope of hydrogen rather than both proton (^{1}H) and deuterium (^{2}H). It emits low energy β- particles with low penetrating range (٦ mm in air). The maximum β- energy of tritium is ١٨,٦ KeV and its half life is ١٢,٢٦ years. So tritium is radiotoxic and has become one of the problem pollutants at many nuclear facilities.

Immobilization of low level radioactive wastes (LLW) is important step in any radioactive waste management program.

The main aim of the present work is immobilization and fixation of tritiated water in polyacrylic acid. The solidification waste forms should have adequate characteristics to withstand the operation conditions.

The work covered investigation on the physical, mechanical, thermal and chemical properties of the solidified waste form. Also the total effective dose equivalent "TEDE" in man by using a computer program called Decontamination and Decommissioning computer code (D&D program) was calculated.

It was concluded that polyacrylic acid can incorporate about ٥٠ % tritiated water and the effect of water content and irradiation dose on the compressive strength was studied. The cumulative leach fraction for tritium from polyacrylic acid blocks increases when sea water using as leachant more than both underground water and distilled water.

The mechanical, thermal, physical and leaching data obtained illustrated the suitability of acrylic acid for solidification of tritiated waste water.

From the decontamination and decommissioning computer code (D& D Program) it was found that the probability to receive high dose from exposure to contaminated distilled water is lower than that from both underground water and sea water.

The total effective dose equivalent is affected by the tritium waste concentration that release from near disposal facility and the type of the surrounding media.

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