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PREFACE

In 1982 plans were taken up by the GSF-Institut für Tieflagerung (IfT) to carry out an in-situ experiment in the Asse salt mine in Germany. The experiment was meant to develop and test safe methods for the final disposal of vitrified High-level waste (HLW) in deep geological salt formations.

The partners of the IfT in this project, co-sponsored by the national governments and the European Commission (EC) were the French Agence nationale pour la gestion des déchets radioactifs (ANDRA), the Energieonderzoek Centrum of the Netherlands (ECN), and the Spanish Empresa Nacional de Residuos Radiactivos, S.A. (ENRESA).

Besides the development of a transport and emplacement system for HLW-canisters and the investigation of the response of the host rock to the thermal load of HLW, the effects of γ -radiation in natural rock salt represented a major issue of the project.

It was planned, therefore, to emplace thirty vitrified highly radioactive radiation sources spiked with Cs137 and Sr90 in six underground boreholes in the Asse salt mine. On top of each stack of five radiation sources a dummy canister containing salt samples was to be placed. The samples in the dummy canisters should have been irradiated in order to study the radiolytic effects in the salt as a function of temperature, irradiation dose and dose rate.

Unfortunately, due to licensing uncertainties the radiation sources were never emplaced in the Asse salt mine and, hence, the in situ irradiation experiments never took place. The originally planned accompanying laboratory irradiation experiments at Saclay (France) and Petten (the Netherlands) were therefore significantly extended. The understanding of the radiolytic processes in natural rock salt has been significantly extended thanks to the many results obtained in these irradiation experiments.

The chemical conditions under which different gases are produced or released from the salt samples subject to the effect of heat and gamma radiation are now essentially known. Under

disposal conditions in general the rate of gas production and release from rock salt is low and represents no safety problem.

Regarding the radiation damage in the solid salt, the obtained results, aided by computational models that have also been improved during this research, lead to the conclusion that radiation damage produced by *gamma* rays does not constitute a safety problem in cases of the disposal of vitrified High Level Waste (HLW) in boreholes or of the direct disposal of spent fuel in a salt formation.

Before the disbandment of the international group involved in the project it was decided to produce this summarizing volume. Many amongst the involves investigators are now busy with other activities. Unfortunately, Mr. L. Vons who has always been so inspiring left the ECN recently with a well deserved retirement. We are very thankful for his contributions and therefore dedicate this volume to him.

Braunschweig, September 29, 1995

T. Rothfuchs
GSF.
(Project Leader)

Petten, September 30, 1995

A. García Celma
ECN
Editor of this volume.

RADIATION DAMAGE IN SALT

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