

Dosimetry procedure technique for environmental qualification in nuclear power plant

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1. Introduction

In these days, about 400 Nuclear Power Plant is now operating in IAEA member states. Kori unit 1 started commercial operation in 1978 and 40 % of entire electricity is being produced by nuclear energy in Korea. Almost 30 years past, So controlling the ageing degradation and wear out of plant component is becoming more and important to guarantee the safety of continuing operation and it means that checking adequate safety margin remains needed. Radiation investigation through accident analysis suggest the maximum radiation dose of each cell based on design data, but the dosimetry method which would be explained here lowers the safety margin by assessing the practical radiation about each equipment. The key factor of ageing matters are temperature and radiation effect, Radiation Health Research Institute would assess the radiation level in cooperation with Wolsung Nuclear Power Plant by ESR dosimetry method with the alanine and lithium formate monohydrate samples. Wolsong Unit 1. The method of dosimetry is that First, install dosimeter at the location of interest in times of pre-scheduled maintenance period then, after one or two fuel cycles, retrieve and analyze the dosimeters by use of ESR dosimetric system. This method depend on characteristics of alanine dosimeter which is independent of irradiation energy and extremely low fading.

2. Procedure

The dose assessment method of non metallic material is as followed(referred to the IAEA technical documentary[1], First install the alanine dosimeter and retrieve the dosimeter during pre-scheduled maintenance period of NPP, last step is the analysis by ESR system. But alanine dosimeter is not so sensitive in the range of under 1 Gy .

So this weakness should be overcome by proper method in the future study. The characteristic of dosimeters and experiment procedure are as follows.

2.1 Characteristic of dosimeters

Alanine and lithium formate sample are not significantly affected by temperature(at irradiation time: 0.2%/K deciation) and also fading rate at moderate temperatures is limited to 1% per year.[2]. The influence of humidity can be overcome by hermetic sealing of the dosimeter.[3]. The neutron dose to cable materials can generally be neglected during normal

plant operation. At present the dose range possibly assessed is at least 1 Gy to 200 kGy[4]. But the quantity of radical is influenced by temperature and humidity of environment. It means before and after environment could be the key factor to assess the dose quantity. So, to prevent these side effects from environment, the dosimetric procedure should be done with great care. And, also the papers of these days show us the effect of UV light(sun ray) and fluorescent lamps

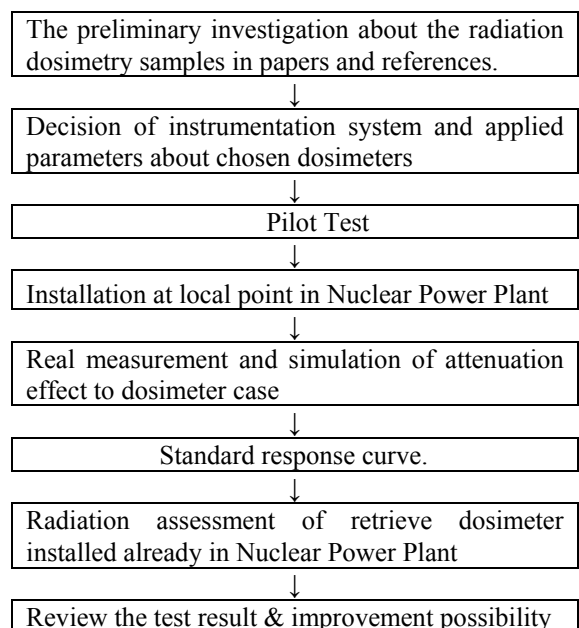


Table 1. Flowchart of ESR measurement and dose assessment

2.2 Dosimeter installation

The used dosimeters were BioMax alanine dosimeter which contain α -amino acid alanine, $\text{NH}_2\text{-C}_\alpha\text{H}(\text{CH}_3)\text{-COOH}$ and Teflon as binder material to form dosimeter as pallet(ratio>9/1). Cylindrical form of pallet has the dimension of 5mm in diameter and 3mm in height.

The effect of moisture is already know key factor before and after irradiation, so the case for preventing these effects was designed and made for dosimeter installation the below picture is the structure of alanine case.

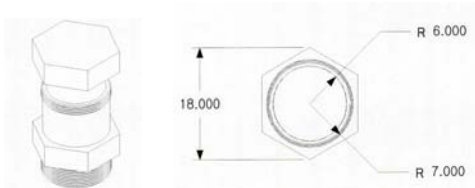


Fig1. Alanine sample case design

3. Discussion

The several matters should be overcome in the future study like information about temperature and humidity effects before and after irradiation and dosimeter store place. The possibility of deviation from normal value shall be checked and confirmed carefully. And the attenuation effect by designed polyethylene case, the application of universal parameter which used for all dose range should be considered. The sustain of environment condition for relatively long time, at least two year, appropriate standard marker choice suited to alanine sample and attachment of supportive device for upgrading measurement accuracy should be considered in future study.

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