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Dissolved gas measurements of the cooling ponds of Paks Nuclear Power Plant, Hungary

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The aim of this work was the investigation of the effect of nuclear fuel rods to the composition of the dissolved gas in the cooling water of the cooling ponds of Paks Nuclear Power Plant (Paks NPP).
In normal cases after three-year usage in the reactor the spent fuel elements are stored in cooling ponds for years before delivering out from the reactor area. In April of 2003 with the failure of the cleaning procedure of fuel rods from reactor No. 2 some elements remained in service pool No. 1. For better handling of this situation and planning the repairing procedure several parameters must be considered. The gases dissolved in the coolant, especially the ones produced by fission or decay, are good indicators of the variation in state parameters of the system in this situation as well as in the case of working reactors. Parallel with the measurements of dissolved gases in the coolant for surveying the kilter of the nuclear fuel remained in service pool No.1 we also measured these parameters in the cooling ponds as a reference. The reason was the similar technological situation because in both cases the coolant contains out of work fuel elements and the headspace gas above is air with atmospherically pressure.
In this work we investigated the effect of the nuclear fuel rods to the composition of the dissolved gas in the coolant of the cooling ponds and the service pool No.1 of the reactor No. 2 of Paks NPP. We measured the quality and the quantity of the dissolved gases and the isotope compositions of the noble gases produced in fission or decay. For these aims sampling and measuring methods were developed.
Our results help to ascertain the possible ways and rates of gas generation processes caused by the presence of nuclear fuel rods in the cooling water.

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