DETERMINATION OF URANIUM TRACES IN NUCLEAR REACTOR IEA-R1 POOL WATER

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Uranium traces in nuclear reactor pools are normally inspected avoiding levels over 50 $\mu g.L^{-1}$. The environment protection control for uranium content establishes the uranium level being less than 15 $\mu g.L^{-1}$ in order to discard wastewater as sewage. There is a toughing of government regulation in this field, since this level was officially 30 $\mu g.L^{-1}$ up to recently. The environmental policies imposes not only strict standards of control, but also, higher frequency of sampling and well settled statistics industrial control, using instruments as SPC (Statistical Process Control). Nuclear Fuel Plant of IPEN is working on an adequate control system based on uranium traces evaluation throughout the wastewater originating in its fuel fabrication, mainly in the chemical manipulation of UF_6 and UF_4 sector. As a similar work, we can provide the level of uranium content for operational routine of IEA-R1 nuclear reactor pool water. There are several routes to determine the uranium content in tap water, using the polarography, already known in the literature. In the present study, the chosen chemical determination of uranium traces uses the electrochemical method ACSV (adsorptive cathodic stripping voltammetry). This method should account with strict setting of variables in order to achieve feasible error level. The main route uses chloranilic acid [CA] (2,5-dichloro-3,6-dihydroxy-1,4-benzoquinone) which is not straightforward in use. Depending on the uranium content level, the response of redox reaction of the UO_2^{2+} imposes many restrictions and varies intensively with reduction potential of $[UO_2(CA)_2]$-complex. The main considered variables are the analyzed sample volume, the pH of the solution, the acidulation acid and additions to improve the peak response, as EDTA-2Na and KNO_3. As non-trivial determination, the U-traces determination demands intense research to establish a proper method. In this work, we present the results of IEA-R1 reactor water determination, after operation routine. The results show uranium content level of 100% less than 10 $\mu g.L^{-1}$), within 6% error, which represents good results for small quantities and equipment limitation. In general, we are scrutinizing the uranium content in IEA-R1 pool water to keep it below 30 $\mu g.L^{-1}$. This inspection is fully crucial, since the level for the future RMB reactor is still unknown and should be as less as possible, once the power of the reactor will be of 30 MW.