

Determination of Gross Alpha and Gross Beta Activity in Water Samples by iSolo Alpha/Beta Counting System

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Abstract : The determination of gross alpha and beta activity in water is important in a wide array of environmental studies and these parameters are considered in international legislations on the quality of water. This technique is commonly applied as screening method in radioecology, environmental monitoring, industrial applications, etc. Measuring of Gross Alpha and Beta emitters by using iSolo alpha beta counting system is an adequate nuclear technique to assess radioactivity levels in natural and waste water samples due to its simplicity and low cost compared with the other methods. Twelve water samples (Six samples of commercially available bottled drinking water and six samples of industrial waste water) were measured by standard method EPA 900.0 consisting of the gas-less, firm wear based, single sample, manual iSolo alpha beta counter (Model: SOLO300G) with solid state silicon PIPS detector. Am-241 and Sr90/ Y90 calibration standards were used to calibrate the detector. The minimum detectable activities are 2.32mBq/L and 406mBq/L, for alpha and beta activity, respectively. Each of the 2L water samples was evaporated (at low heat) to a small volume and transferred into 50mm stainless steel counting planchet evenly (for homogenization) and heated by IR lamp and the constant weighted residue was obtained. Then the samples were counted for gross alpha and beta. Sample density on the planchet area was maintained below 5mg/cm. Large quantities of solid wastes sludges and waste water are generated every year due to various industries. This water can be reused for different applications. Therefore implementation of water treatment plants and measuring water quality parameters in industrial waste water discharge is very important before releasing them into the environment. This waste may contain different types of pollutants, including radioactive substances. All these measured waste water samples having gross alpha and beta activities, lower than the maximum tolerance limits for industrial waste water discharge of industrial waste in to inland surface water, that is 10-9 μ Ci/mL and 10-8 μ Ci/mL for gross alpha and beta respectively (National Environmental Act, No. 47 of 1980). This is according to extraordinary gazette of the democratic socialist republic of Sri Lanka in February 2008. The measured water samples were below the recommended radioactivity levels and do not pose any radiological hazard when releasing the environment. Drinking water is an essential requirement of life. All the drinking water samples were below the permissible levels of 0.5Bq/L for gross alpha activity and 1Bq/L for gross beta activity. The values have been proposed by World Health Organization in 2011; therefore the water is acceptable for consumption of humans without any further clarification with respect to their radioactivity. As these screening levels are very low, the individual dose criterion (IDC) would usually not be exceeded (0.1mSv y⁻¹). IDC is a criterion for evaluating health risks from long term exposure to radionuclides in drinking water. Recommended level of 0.1mSv/y expressed a very low level of health risk. This monitoring work will be continued further for environmental protection purposes.

Keywords : drinking water, gross alpha, gross beta, waste water

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