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Quality Control and Validation of Gamma and Alpha Spectrometric Techniques for NORM Measurements.

Analytical quality control procedures and method validation are essential in carrying out analysis using alpha and gamma spectrometry systems in order to authenticate the quality and reliability of measurements. In this work results of quality control and method validation for both gamma and alpha spectrometry systems used in the measurement of NORM are presented. The IAEA reference materials IAEA-RGU-1(U-ore) and IAEA-RGTh-1 (Th-ore) with mean densities (1.33 ± 0.03 g/cm3) similar to the mean densities of solid matrix samples to be measured were prepared into petri dish containers of the same type as that of solid matrix samples and were used to estimate the efficiencies for photo peaks of natural radionuclides measured and quantified in the samples. For liquid matrix samples, a multi-gamma certified cocktail standard (210Pb, 241Am, 109Cd, 57Co, 139Ce, 113Sn, 85Sr, 137Cs, 60Co and 88Y) was prepared into a 1L marinelli beaker with mean density of 1.0 g/cm3 and used for efficiency calibration of the gamma system. The accuracy and precision of analytical procedures used in this study for both gamma and alpha spectrometric techniques were also validated with the analysis of IAEA SRMs (IAEA381, IAEA375 and IAEA 414) under the same experimental conditions as the samples. The sensitivity of the method used in this work was in good agreement with the reference values for IAEA SRMs. The radiochemical recovery or yield in alpha spectrometric determination is also an important parameter in validating the reliability or authenticity of results obtained using alpha spectrometry. Generally, it is required that for alpha results to be acceptable and reliable the radiochemical yield should not be less than 30%. In this work average radiochemical yield of radionuclides analyzed for various samples matrices via alpha spectrometry are presented. The lowest average yield was 41.2% recorded for Po in produced water and the highest was 84% for Th in crude oil.

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