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SCINTILLATION DETECTORS FOR ^{222}Rn IN AIR AND WATER

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The presence of ^{222}Rn in the environment is of interest for several sciences, with different emphases.

^{222}Rn represents an important radiological risk for mine workers, who may inhale the high concentrations of ^{222}Rn and its daughter products built up in closed spaces.

Even from the public health point of view a number of ^{222}Rn sources have been recently made available by technological developments (1), and their potential radiological risk to the populations is being evaluated (2). Geothermal fields and natural springs may als increase ^{222}Rn concentrations in their environs (3). The managing and control of environmental quality requires, therefore, adequate methods for ^{222}Rn measurement.

^{222}Rn is also of interest in tracing atmospheric events and in evaluating meteorological parameters as well as to forecast seismic phenomena (4).

The possible applications of a scintillation counter of the type developed by DiFerrante (5) have been tested. This counter consists of a spherical cavity coated with ZnS(Ag) powder, built in a lucite cylinder whose external surfaces, excepting the window to be put in contact with a photomultiplier, are made reflective with a special paint.

By means of the mathematical function expressing the probability of detection for an alpha particle emitted by a ^{222}Rn nucleus at any point of the detector, its performances have been analyzed versus basic parameters as: size, efficiency, background, constant activity and constant concentration in the sample.

For liquid samples, to be measured with a deemanation circuit, two different values for the diameter (5 cm and 7.5 cm) proved to be suitable for two different deemanators, one for laboratory measurements of low activities (down to 0.03 pCi), the other for field measurements (down to 0.2 pCi) (6,7).

For air samples, larger sizes (up to 12 cm) appeared suitable even at low natural levels (0.1 pCi/l).

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