

Use of Environmental Measurements as a Tool to Understand Factors Influencing Radionuclides Concentrations

Radon (Rn-222) is a radioactive gas that originates from uranium (U-238) and is ranked as a major source of natural ionising radiation and identified among the leading causes of lung cancer. It is therefore essential for its occurrence and concentration levels present in the environment to be well understood, quantified and assessed. This study characterised indoor radon levels regionally in the gold mining sites of Gauteng Province and coal mining sites in the Mpumalanga Province using the solid-state nuclear track detectors, which were deployed predominantly during summer and winter months. Moreover, radon parent nuclides were determined in mine tailing residues, soils, rocks and water to help in the understanding of the primary sources and controls of radon.

The study aimed to evaluate the extent to which the local conditions such as the underlying lithology, content of the parent radioisotopes in primary sources, mining activities, seasonal variations and building characteristics affect indoor radon. It was found that the gold tailings residues and coal related operations have no drastic effect on indoor radon concentrations measured in the dwellings studied, other than at a localized location where contamination resulting from tailings materials was observed. The major contributing factors were the uranium content in geological formations and soil, which depicted a positive correlation with indoor radon concentrations at $R^2 = 0.7827$ for rocks and $R^2 = 0.5302$ for soil. The uranium content in the ground surface was proven to be a good first indicator of indoor radon. Contributions from water to indoor radon were found to be negligible. Variations in meteorological conditions with seasons, ventilation rate of the house and the rooms where measurements are conducted, the age of the dwelling and type of building materials were found as additional contributors and controls to indoor radon concentrations.

Primary author: Mrs MARAKALLA, Paballo (National Nuclear Regulator (CNSS))

Co-authors: Prof. ABIYE, Tamiru (University of the Witwatersrand); Dr KORIR, Ian (National Nuclear Regulator (CNSS)); Dr NHLEKO, Sifiso (National Nuclear Regulator (CNSS))

Presenter: Mrs MARAKALLA, Paballo (National Nuclear Regulator (CNSS))

Track Classification: Environmental Measurements