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Radioxenon isotopic ratios from activation of stable xenon in releases from nuclear facilities in relation to fission sources visualized in multi-isotope-ratio plots

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Evidence has shown that besides radioxenon from fission, release of activation-generated radioxenon can occasionally be observed at noble gas systems of the International Monitoring System (IMS). The literature appears to show conflicting results for the isotopic ratios from activation of stable xenon in the releases from nuclear research reactors (NRRs). This study uses ORIGEN simulations to investigate various scenarios of generating radioxenon from activation. Different neutron spectra and activation of air as well as gas dissolved in the water are studied. The main goal is to test the hypothesis that the isotopic activity ratios can be used as a discriminator for activation or fission being the dominating source of radioxenon releases from NRRs or other nuclear facilities. This is important because any source of activated xenon that can be observed in IMS samples may release other activation products as well ^{125}Xe , ^{127}Xe and $^{129\text{m}}\text{Xe}$ which interfere with the beta-gamma spectroscopy analysis methods which are applied by the International Data Centre (IDC). This is an important scientific foundation to decide whether interference corrections for these non-traditional radioxenon isotopes need to be introduced to the operational software.

Promotional text

A foundation for estimating the impact that radioxenon generated by neutron activation and released from nuclear facilities can have on IMS samples is presented for deciding whether interference corrections have to be introduced to the operational analysis software.

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