

Isotopic signature of radioargon released from the FRM-II reactor

Both radioargon isotopes ^{37}Ar and ^{39}Ar could be useful signatures for an underground nuclear explosion (UNE). Therefore, an On-Site Inspection team will sample and analyse soil gas to verify compliance with the Comprehensive Nuclear-Test-Ban Treaty once it has entered into force. This report studies the potential interferences of a civilian facility on both radioargon isotopes by calculating the annual releases and evolution of the isotopic ratio at a research reactor. It is also focusing on the time variation of the stack emissions and isotopic ratios. Prior to release, the hot water layer system and mechanisms of diffusion are affecting the radioargon ratios. Analysis of the ^{37}Ar to ^{39}Ar found that similarly to an UNE the ratio is mainly a function of both half-life ratios. ^{39}Ar stack releases are very low compared to other argon isotopes. Therefore, the impact on the background is believed to be limited to the vicinity of the nuclear facility. On the other hand, considering that the first nuclear test took place in 1945, ^{39}Ar due to its long half-life can be utilised as a signature for legacy test sites.

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