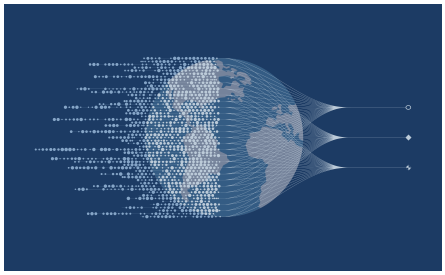

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Research on Intelligent Sampling Process for Atmospheric Radioactive Xenon Based on Online Mass Spectrometry

Wednesday 10 September 2025 11:00 (1 hour)

In response to the demand for high-sensitivity monitoring atmospheric radioactive xenon isotopes, this study investigates an intelligent dynamic sampling method based on online mass spectrometry technology. Traditional atmospheric xenon sampling processes rely on time-fixed control modes and stable xenon measurement techniques using thermal conductivity detectors, which suffer from issues such as process response lag and fluctuations in sample purity. This research integrates an online mass spectrometer with a micro gas sampling device, achieving a comprehensive online monitoring system capable of semi-quantitative real time detection from ppb-level atmospheric concentrations to high-purity xenon. The core of the intelligent sampling technology lies in establishing a collaborative control system between the online mass spectrometer and a programmable logic controller (PLC). By using the xenon concentration signals fed back from the online mass spectrometer, the PLC can dynamically adjust the adsorption and desorption parameters, replacing the traditional fixed-timing control logic and enabling real time optimization of process parameters. The application of this intelligent dynamic sampling technology is expected to significantly enhance the accuracy and timeliness of atmospheric radioactive xenon monitoring, providing a solid technical foundation for the intelligent and adaptive development of atmospheric radioactive xenon sampling.

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