

Air Sampling During NPP Accident

There has been considerable interest recently generated regarding emergency air sampling protocols as a result of the Fukushima accident in Japan.

A major concern involving air sampling requirements is the accurate determination of gaseous-radioactive iodine species emitted from the NPP to the environment as a result of an accident.

During normal NPP operation gaseous radioactive iodine isotopes are collected on TEDA impregnated charcoal cartridges followed by gamma spectroscopy analysis in the radiochemistry laboratory. The collection of gaseous iodine species on the charcoal cartridge can be performed utilizing fixed station, or portable air sampling systems.

During NPP accident conditions there is a considerable amount of noble gases emitted along with the gaseous iodine species. These noble gases interfere with the accurate determination of the radioactive iodine isotope activities.

Unfortunately, the charcoal cartridge is a very good adsorber of the noble gases also. The noble gases include several radioactive isotopes of Xenon (Xe) and Krypton (Kr).

The noble gas radioisotopes interfere significantly with the ability to analytically determine the activity of various radioactive iodine isotopes such as I-131, I-125, I-129 etc. by raising the Compton background of the spectra. The raising of the Compton background obscures the primary I-131 - 364 keV peak and those of other iodine isotopes to prevent accurate quantitative analytical determination of radioactive iodine species on the charcoal cartridge.

The 1979 accident at the Three Mile Island (TMI) NPP brought this issue to the forefront of the NPP community. The initial air samples collected at and near the NPP with charcoal cartridges had significant amount of noble gases and did not permit the accurate determination of radioactive iodine isotopes such as I-131 with an 8½ day half life.

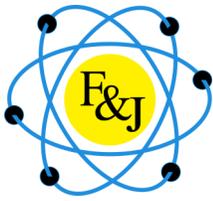
The solution to the problem had been known for years by many nuclear scientists, but was not common to the NPP community.

The solution to this analytical dilemma caused by high atmospheric noble gas concentrations jointly mixed with radioactive iodine species is to use an adsorbent which does not collect noble gases, but collects only the iodine species.

The use of silver silica gel and silver zeolite materials were both candidates for use as an adsorbent in NPP post accident sampling conditions

F&J experimented with both materials and selected the silver impregnated zeolite material because of its greater stability in humid atmospheres and higher collection efficiencies over a range of typical sampling flow rates

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F&J SPECIALTY PRODUCTS, INC.

The Nucleus of Quality Air Monitoring Programs

F&J manufactures silver zeolite radioiodine collection cartridges in two different mesh sizes (particle ranges). These different mesh sizes are as follows:

Bulk Material Part #	US Mesh	Particle Size Range (mm)
AGZ164	16 X 40 mesh	1.17 to 0.417
AGZ35	30 X 50 mesh	0.589 to 0.295

The 16x40 mesh particle size adsorbent (AGZ164) is ideal for use with battery powered air samplers where low pressure drop adsorbent favors longer operation on batteries.

The 30x50 mesh particle size adsorbent (AGZ35) is good for general purpose use in low volume and high volume air sampling systems.

All NPP and regulatory agency emergency response teams should stock silver zeolite cartridges in their emergency kits and other radiological emergency preparedness storage facilities.

The silver zeolite cartridges should be utilized in the fixed station environmental sampling stations following a reactor accident until the noble gas concentrations have diminished to near background levels.