Radioactivity in Aerosols Formed in Accelerator Facilities

Y. Oki[1#], N. Osada[2], S. Sekimoto[1], M. Numajiri[3], T. Miura[4], Y. Ishi[1], T. Uesugi[1], Y. Kuriyama[1], and M. Sakamoto[1]

[1] *Kyoto University Research Reactor Institute (KURRI), Kumatori, Osaka 590-0494, Japan*
[2] *Graduate School of Engineering, Tohoku Univ., Aoba, Sendai 980-8579, Japan*
[3] *J-PARC Center, Tokai, Ibaraki 319-1195, Japan*
[4] *Radiation Science Center, KEK, Tsukuba, Ibaraki 305-0801, Japan*

 # a corresponding author: E-mail oki@rri.kyoto-u.ac.jp

Two kinds of radioactive aerosols are important in radiation safety in high-energy accelerator facilities. One is the aerosols formed in air of accelerator rooms or tunnels during accelerator operation, the other is the aerosols (fumes) generated in machining, welding or thermal cutting operations for activated material. This paper shortly describes features of both aerosols, and their particle size and radioactivity are discussed from the viewpoint of radiation safety.

Particle size of the radioactive aerosols was measured in the 150-MeV FFAG proton accelerator in KURRI using a graded screen array system. The particle diameter was found to be approximately 50 nm for the ^{7}Be aerosol particles. It was compared with that obtained in the former 12-GeV proton synchrotron (PS) in KEK [1] and other facilities. The radioactive aerosol particles are formed by incorporating the radioactive atoms into non-radioactive aerosol particles formed through radiation-chemical reactions in air. The particle size for the radioactive aerosols was, in most cases, slightly larger than that for the non-radioactive aerosols.

On the other hand, thermal cutting of the activated metal generates a large amount of the radioactive fumes containing various radioactive nuclides. In order to collect the radioactive fumes, the plasma cutting experiment was carried out by using the activated metal plates containing various radionuclides [2]. Volatile radionuclides like ^{22}Na were found to be easily concentrated in the fumes. This result may give us useful information about the generation mechanism of the radioactive aerosols in the J-PARC accident in May of last year.

References

[1] K. Kondo, H. Muramatsu, Y. Kanda, and S. Takahara, Int. J. Radiat. Isot. **35**, 939 (1984).
[2] Y. Oki, M. Numajiri, T. Suzuki, Y. Kanda, T. Miura, K. Iijima, and K. Kondo, Appl. Radiat. Isot. **45**, 553 (1994).