

## 平成 22 年度 博士後期課程学位論文要旨

学位論文題名（注：学位論文題名が欧文の場合は和訳をつけること）

**Characterization of Naturally Occurring Radioactive Materials Including Radon and Thoron  
from Environmental Samples**

（環境試料におけるラドン・トリロンを含む自然起源放射性物質の特性評価）

学位の種類： 博士（放射線学）

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Recently, several countries pay more attention to the radiation dose received from natural occurring radioactive materials (NORM). NORM is considered to be any nuclide found radioactive in its nature physical state (IAEA 2004). So uranium, thorium, radon and thoron are good examples of NORM. Building materials could maintain high level of NORM especially by-product materials and granite. Radionuclides concentrations of  $^{238}\text{U}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$  of building materials used in Japan were measured using  $\gamma$ -ray spectroscopy and ICP-MS techniques. The two techniques show good agreement. Based on those radionuclides concentrations data, health hazard indexes were calculated and compared with the worldwide safety limit. Almost of the selected building materials show radionuclides activity and radiological values lower than worldwide safety limit. Radon, thoron and their decay products contribute more than half of radiation dose (UNSCEAR 2000). They are also considered to be the second cause of lung cancer after smoking (WHO 2004). Consequently, an extensively studies were conducted on the migrating processes of radon and thoron from the selected building materials and their influence factors. Radon emanation coefficient was measured using an accumulation method. Water content within the surface's layers of the materials and the material's temperature show drastically increase in radon emanation coefficient. Moreover radon and thoron exhalation rates of the selected building materials were measured. The dependence of influence factors (emanated radon, sample thickness, water content and relative humidity) on radon and thoron exhalation rates was also deeply studied. During the present studies, a simple technique was developed to study the effect of humidity on radon and thoron exhalation rates. In addition, the effective dose equivalent, of radon migrated from the selected building materials when they installed in a real dwelling, was calculated based on the measured values of radium concentration, radon emanation coefficient and radon exhalation rate.