低放射化遮蔽のための建築材料のデータベースの開発

Development of construction material database for low-activation sheilding

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Shielding condition	Setting photon source			Calculated dose rate		Description
	Material	Nuclide	Activity (Bq/g)	(μSv/h)	Ratio to soils	
Without shield	Soils	^{134}Cs, ^{137}Cs	30.6,47.6	0.851		Bare
Ordinary concrete shield 0.2m thickness	Soils	^{134}Cs, ^{137}Cs	30.6,47.6	0.0896		Contaminated soils
	Concrete	^{134}Cs, ^{137}Cs	0.039,0.061	0.0108	12%	Clearance Level
	Concrete	^{40}K	0.738*	0.0138	15%	NORM
Middle density concrete shield 0.15m thickness	Soils	^{134}Cs, ^{137}Cs	30.6,47.6	0.0657		Contaminated soils
	Aggregate 1	^{134}Cs, ^{137}Cs	0.99,1.2	0.146	222%	Slag 1
	Aggregate 2	^{134}Cs, ^{137}Cs	0.18, 0.29	0.0313	48%	Slag 2
	concrete	^{134}Cs, ^{137}Cs	0.039,0.061	0.00818	12%	Clearance Level

概 要

福島第一原発の事故により広範囲に撒き散った放射性セシウムにより、日本の国土の半分程度の部分が影響を受けた。これは、その半減期の長さにより長期間にわたる問題となり、国土から供給される物質、特に建設資材にも大きな影響を及ぼす。そこで、本論文ではコンクリート材料にも使用されるフライアッシュやスラグについて天然放射能や人工放射性物質（たとえば事故後のセシウムなど）の測定を行った。さらにその結果を受けて、ひとつの考察として、放射性セシウムで汚染された資材が、事故により広がった汚染された土砂などの物質の遮蔽材として利用された場合の影響を評価し、ひとつのケースで汚染された材料を使用した場合の遮蔽材からの線量が格納した物質からの線量よりもおおきいという結果を得た。それにより、建設資材について事故後の前後を含む広範な放射性物質の評価が必要で、低放射化材料データベースの構築には、この部分の開発が重要であることが示唆された。

After huge quantities of radioactive plume were dispersed over almost half of Japan, radioactive cesium has been detected across a large percentage of Japanese land. That causes some effects to the raw material for construction work and this influence will continue to expand because of ^{137}Cs. Due to this situation, the development of a radioactive database for construction materials after March 11th 2011 has been started to compare with a database from before the accident in Fukushima. In this paper, some natural radioactivities in fly ash were reported to understand the baseline level of radioactivity. Secondly, radioactive cesium in combustion ashes and slags, which were taken from all over the Japan after the accident, were measured to investigate the levels of contamination. Based on the measurements obtained, the trial investigation of the influence of the use of the construction materials with radioactive cesium on the shielding pod was conducted using a Monte Carlo calculation. The calculated dose rates from the shielding concrete itself with radioactive cesium were greater than those from concrete shielding pods containing contaminated soils in one case. These results confirmed the necessity of the development of radioactive database for the construction materials.