ABSTRACT

In Japan, the major environmental concern on the radioactive cesium (137Cs) deposition and its contamination on soil, water, ash, sediment etc. due to the emission from the Fukushima Daiichi Nuclear Power Plant showed up after a massive quake on March 11, 2011.

- Fukushima prefecture exceed the government’s safe limit of 2000 Bq/kg of cesium-137 in soil.
- According to the Japan science ministry about 8 percent of the country’s land has been contaminated with levels higher than 10,000 Bq/m².
- By the end of March 2012, ash containing 100,000 to 140,000 bequerels per kilogram (Be kg⁻¹) of 137Cs was also recorded.
- High levels of 137Cs are also present in incineration ash from normal garbage.
- Temporary disposal sites for incinerated ash containing 137Cs and 134Cs are rapidly filling up. No alternative landfills are available.
- Soil/ash contamination with 137Cs has a long-term radiological impact because of its long physical half-life (30 years) and it single biological availability.

Therefore, the cesium fixation and immobilization in contaminated soil/ash is recognized to be one of the most difficult problem solved by taking advantage of suitable technologies.

Present study, concern these problems by applying potential Nano-Fe/ Ca/CaO Composite Enabled Environmental Remediation Technologies for Radioactive Waste

INTRODUCTION

Preliminary results of the immobilization of radioactive cesium in fly ash by magnetic separation from the contaminated fly ash were presented. The immobilization was observed in the form of precipitation of CaC2O4. The immobilized fly ash was utilized in the construction of a clay composite. The potential to immobilize cesium via a magnetic separation technique was also demonstrated in a laboratory scale.

The samples were collected and analyzed for their cesium content after the immobilization process. The results showed a significant decrease in cesium content in the treated samples compared to the control samples.

EXPERIMENTS

Application for the Remediation of Radioactive Cesium-Contaminated Soil/ Ash

Mechanochemical process for preparation of nanocalcium (Solvant free/dry system)

Nanometric Ca/CaO Methanol Suspension Preparation

Potential for H.M. treatment by... 

RESULT AND DISCUSSION

In situ remediation of radioactive Cs in “Soil”

CONCLUSIONS

- Radioactive cesium contaminated soil (obtained from Fukushima) was treated with nano-Fe/ Ca/CaO(P/DP), approximately 22.5% of magnetic and 77.5% of non-magnetic soil fractions were separated.
- The highest amount of entrapped 137Cs was found in the lowest weight of the magnetically separated soil fraction (i.e., 80% in 27.26% of treated soil).
- 137Cs either in the magnetic or non-magnetic soil fractions was 100% immobilized.
- Thermal treatment with nanometric Ca/CaO amendments also a promising treatment for the ultimate immobilization of radionuclides (137Cs) in soil, with zero evaporation.
- Nanometric Ca/CaO methanol suspension showed high capability in removing and/or immobilizing 137Cs in contaminated fly ash investigated.
- The tests carried out have shown that the leaching of Cs from the products of treated soils is below what is specified by Japan regulations.