VERSATILE CHEMICAL HANDLING METHOD TO CONFINE RADIOACTIVE CESIUM AS STABLE INORGANIC CRYSTAL: X-RAY EVIDENCE

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After critical nuclear accidents in the recent past, radioactive ^{137}Cs – one of the most problematic fission products, has been released into the environment, causing significant concerns in terms of the public health risks in the contaminated areas. Therefore, many efficient methods suitable for absorption/adsorption of ^{137}Cs have been proposed. Hydrothermal procedure was first introduced to confine Cs as stable inorganic crystal, pollucite ($CsAlSi_2O_6$), in the pioneering work [1] by Yokomori *et al*. Using clay sources such as clinoptilolite and mordenite for Al and Si, they also needed other additives such as $AlCl_3$ to adjust the mole ratio as Cs:Al:Si = 1:1:2. The present solvothermal method proposes the use of montmorillonite (MMLT, $(Na, Ca)_{0.33}(Al, Mg)_2 Si_4O_{10}(OH)_2$-$nH_2O$), mixed with ethylene glycol (EG) as a solvent, rather than water. It has been found that the reduction of the amount of water helps to achieve very high confinement rate in a reasonable time of few~20 h [2].

Pure CsCl powder containing only non-radioactive Cs was used for the experiment. Crystalline pollucite was reproducibly obtained from the source material by heating up to 320~350 °C in a high-pressure container (~6-15 MPa). A small addition of NaOH (~8 wt% of CsCl) effectively stabilizes the synthesis. The present method is also promising for handling Cs waste in seawater [2]. Crystal structure and chemical composition of final products were analysed by X-ray techniques, including XRD and XRF.

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REFERENCES

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