

Removal of cesium in contaminated water using Prussian Blue

Wontae Lee(wtlee@kumoh.ac.kr)

Kumoh National Institute of Technology

Abstract

We investigated removal of cesium (^{133}Cs) in contaminated surface water by coagulation with prussian blue addition. The radionuclide used in the experiment was a stable cesium isotope (^{133}Cs). Coagulation tests were conducted using a jar-tester. A rapid agitation was at 200 rpm for 1 minute, and a slow agitation at 50 rpm for 15 minutes. After 20 minute sedimentation, samples were analyzed for ^{133}Cs using ICP-MS (Agilent, ICP-MS 7500, USA). Prussian blue was injected as solid and liquid types. The solid prussian blue had a mean particle size of about 2,000 nm. Liquid prussian blue was prepared by synthesizing iron (III) chloride and potassium ferrocyanide, and had a particle size of about 80 nm. As a result of injecting two kinds of prussian blue into water contaminated with 0.1 mg/L of cesium, it was found that more than 250 mg/L of solid type Prussian blue was required to remove cesium over 98%. The liquid (colloidal) prussian blue showed more than 98% removal rate of cesium only with 5 mg/L. Liquid type prussian blue showed higher removal rate with a small amount. However, there was no way to remove the nano-sized prussian blue that was flocculating after adsorbing cesium. To overcome this concern, we added 20 ppm of coagulant (PACl) and found that nano-size prussian blue was combined with the added coagulant thus settling down. Through the combination of prussian blue and coagulant, river water contaminated with cesium can be purified.

Keywords: *Cesium, water treatment, prussian blue, adsorption*

References

- [1] Cheon, K. H., Choi, J. H. et. (2014) Adsorption Characteristics of Cobalt, Strontium, and Cesium on Natural Soil and Kaolin, J. Environ. Sci. Int., 23(9), 1609~1618.

Biography

Wontae Lee is an associate professor in the Department of Environmental Engineering at Kumoh National Institute of Technology. Prof. Lee has experienced various research projects related to water treatment, water reclamation and reuse, and desalination as a principal investigator. Prof. Lee has published over 70 papers in journals related to Environmental Engineering.