

Research Note

# Removal and Condensation of Cesium Ion from Water Phase into Ionic Associate Phase Using Tetraphenylborate

Shogo KUMAGAI, Kotaro HAYASHI, Tomohito KAMEDA, and Toshiaki YOSHIOKA\*

Graduate School of Environmental Studies, Tohoku University  
(6-6-07 Aoba, Aramaki-aza, Aoba-ku, Sendai, Miyagi 980-8579, Japan)

## Summary

Importance of minimization of sludge volume derived from waste water treatment of Fukushima Daiichi Nuclear Power Plant is recognized due to the difficulty of procuring enough area for temporary facility site and final disposal site. In this work, tetraphenylborate (TPB<sup>-</sup>) was applied for selective removal of Cs<sup>+</sup> from water phase, which was further condensed into ionic associate phase consisting of perfluorooctanoate (PFOA<sup>-</sup>) and n-hexyltriphenylphosphonium ion (HTPP<sup>+</sup>) or pentylamine ion (PA<sup>+</sup>). The present work achieved the maximum Cs<sup>+</sup> extraction rate from water phase of 97% and enhanced the maximum condensation rate by  $3.0 \times 10^2$  times into PA<sup>+</sup>/PFOA<sup>-</sup> ionic associate phase. In addition, influence of K<sup>+</sup> and Na<sup>+</sup> on the removal and condensation of Cs<sup>+</sup> into ionic associate phase was also investigated, assuming the treatment of waste water contaminated by sea-water. It was revealed that TPB<sup>-</sup> showed selective removal of Cs<sup>+</sup> in the presence of K<sup>+</sup> and Na<sup>+</sup>, and it was further condensed into ionic associate phase. Thus, this work implied the possibility of sludge volume reduction by using this process.

**Key Words:** Cesium, Waste water treatment, Condensation, Ionic associate phase, Tetraphenylborate

---