Abstract

[Project Information]

Project Title : Development of Rapid Boron Removal Method with a Spring Filter

Project Number : JPMEERF20221G02

Project Period (FY) : 2022-2024

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Keywords : Boron removal, Rapid removal, Powdered adsorbent, Spring type filter, Radiation-induced graft polymerization

[Abstract]

The concentration of boron in water discharged into public waters is regulated to be less than 10 mg/L because excessive intake of boron has adverse effects on human health. However, there is no efficient method to remove boron, and new methods need to be developed.

In this study, a new boron removal method combining grafted powder adsorbent with spring type filter capable of precision filtration was invented and its boron removal performance was evaluated. The powdered adsorbent for boron removal was synthesized by radiation induced graft polymerization using cellulose powder having high contact efficiency with water as a trunk material. The cellulose powder was irradiated with gamma rays. After irradiation, it was contacted with deoxidized emulsion solution, which was a mixture of glycidyl methacrylate (GMA), Tween 20, and purified water. GMA grafting was carried out at 40˚C for 1 hour. The GMA-grafted powder was chemically converted to N-methyl-D-glucamine (NMDG). The NMDG density of powder adsorbent was 2.2 mmol/g-adsorben. The evaluation of the new boron removal technique was investigated by passing the 10 mg/L of boron solution through the spring type filter covered with grafted powder adsorbent at a

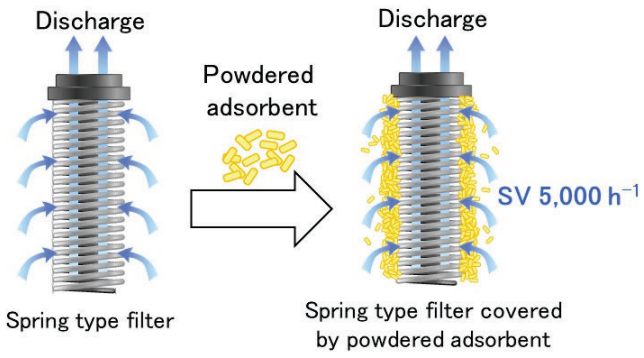

Fig.1 boron removal method combined powdered adsorbent with spring type filter

space velocity [SV] 5,000 h^{-1} (Fig.1). The effluent water was collected at regular intervals, and the concentration of boron in collected samples was measured by Inductively Coupled Plasma Optical Emission Spectrometer [ICP-OES]. As a result of boron removal test, boron was not detected in the effluent until the bed volume [BV] reached 400, which means that all of the boron was adsorbed by the powdered adsorbent even at the high flow rate of SV 5000 h^{-1}. The boron concentration in the effluent increased with continuous flow, reaching 7.5 mg/L at BV of 900. The amount of boron adsorbed in this test was 13 mg/g-adsorbent. The results show that the new boron removal method can efficiently remove boron from solution to low concentrations in a short time.

This research was performed by the Environment Research and Technology Development Fund (JPMEERF20221G02) of the Environmental Restoration and Conservation Agency provided by Ministry of the Environment of Japan.