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Page	Before	After
page 1	**Abstract** In 2011, Fukushima nuclear power plant accident in Japan caused contamination of lakes and rivers due to radioactive materials released. As time passes, the radioactivity of contaminated water has been lowered, but there is still some level of radioactive contamination. And, concerns about nuclear safety have been raised globally. At present, decontamination of radioactive contaminated water uses methods of removing radioactive materials in polluted water by using resin or filter. These conventional decontamination methods can lower the radioactive concentration of contaminated water to a certain level. However, it is difficult to reduce the amount of contaminated water to a level lower than the very low level due to technical and economic reasons. Also, it is a time-consuming and costly process to dispose of a large amount of radioactive waste generated in the dismantling of a nuclear power plant, and many researches are needed to minimize and recycle radioactive waste in nuclear power plants around the world. Micro-algae are a phytoplankton that has recently been re-examined as a future clean energy and material resource. The micro-algae are already a potential resource for producing the energy industry materials and reducing the greenhouse gas. In this study, to measure the radioactivity in the decontamination system using micro-algae, we developed a small prototype of radioactivity measuring device using NaI(Tl) scintillator with Photomultiplier tube.	**Abstract** In 2011, Fukushima nuclear power plant accident in Japan caused contamination of lakes and rivers due to radioactive materials released.. The conventional decontamination methods using chemical precipitation and ion exchange can lower the radioactive concentration of contaminated water to a certain level. However, it is difficult to purify the large amount of contaminated water to a level lower than the very low level due to technical and economic reasons. Microalgae have recently been applied for the removal of the water-soluble radioactive materials as well as bio-energy and high-value material resource. In this study, we develop a small prototype of radioactivity measuring device using NaI(Tl) scintillator with photomultiplier tube in order to measure radioactivity in the decontamination system, which is based on semi-permeable membrane containing radionuclide-removing microalgae into radioactive contaminated water.
page 1	Jongman Lee[2]	Seungyop Lee[2]
page 1	Korea Research Institute of Standards and Science *267, Gajeong-ro, Yuseong-gu, Daejeon, Republic of Korea*[2]	Sogang University[2] *35, Baekbeom-ro, Mapo-gu, Seoul, Republic of Korea*[2]
page 2	Fig.1. Principle of removal of radionuclides using the micro-algae	Fig.1. Principle of removal of radionuclides using the microalgae and semi-permeable membrane
page 2	Fig.2. A cross-sectioned HRTEM image of C. vulgaris cells and Conceptual model for a microalgal absorption and surface- carbonating process.	Fig.2. A cross-sectioned HRTEM image of C. vulgaris cells and Conceptual model for a microalgal absorption and surface-carbonating process.[4]
page 2	Fig.3. Removal efficiency of C. vulgaris in the environment of each radioactive ^{137}Cs contamination	Delete

page 3	Fig 4. A simple diagram of the post-treatment system	Fig 3. A simple diagram of the post-treatment system
page 5	Reference – [2] Brumfiel G(2011) Fukushima reaches cold shutdown. Nature 474: 135-136. [4] Lee SY(2014) Photosynthetic biomineralization of radioactive Sr via microalgal CO_2absorption. [11] Bystrzejewska - Piotrowska G, Urban PL "Accumulation of cesium in leaves of Lepidium sativum and its influence on photosynthesis and transpiration", Acta Biol Cracov Bot 456:131-137(2003) [12] Shin-ya Fukuda, et al., "Global searches for micro-algae and aquatic plants that can eliminate radioactive cesium, iodine and strontium from the radio-polluted aquatic environment : a bioremediation strategy", JPR symposium	Delete