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Preliminary assessment of methane emission characteristics of aerobic constructed wetlands and ecological wetlands near abandoned coal mine in Korea

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Global efforts are underway to reduce the damages from adverse changes to the environment. While a number of previous studies discussed carbon dioxide for greenhouse effect reductions, methane has been relatively less well studied considering the fact that it is 21 times more potent than carbon dioxide as a greenhouse gas. To understand the mechanisms that create methane, it is important to calculate the volume of greenhouse gas created. Methane is commonly known to be produced in an anaerobic environment by methanogens breaking down organic matter; the volume of methane released into the air varies due to the influence of multiple environmental factors, and its sources require quantitative calculation of produced volume by source. The wetlands nearby mining sites feature an environment similar to marshes, which are some of the largest natural sources of methane, and can be a major source of greenhouse gases. As such, this study has conducted basic research on measuring methane production from ecological marshes and wetlands nearby mining sites.
After reviewing wetlands data, four wetlands areas nearby mine sites and four ecological marshes near Daecheong Lake were selected as study sites. To quantify the volume of methane emitted from the surface of the emission source, this study has opted to use the chamber method. With reference to the collecting apparatus discussed in existing literature, floating-type gas collectors were built, tailored to the study sites, and methane was collected from the surface of the water. Also, water quality was analyzed to examine the characteristics of the methane-producing environment. The collected methane was inserted using a syringe into a bottle blocked with a rubber seal and filled with nitrogen for storage; these bottles were moved to laboratories and their methane content was analyzed using GC-FID. This study has calculated the methane flux using the concentration of methane gas collected on an hourly basis, and the correlation coefficients of the methane flux was over 0.9 in all sites except for one.
This study has measured the methane production in various regions by selecting methods and creating collectors to research the methane produced in wetlands near mining areas and ecological marshes. This study confirmed that the flux ranges varied depending on the marshes; the quantitative calculation of the mechanism of methane production will require continued, long-term research endeavors.