

Material dynamics in Lake Biwa

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1. Abstract

In 21 century, the environmental issues are becoming more severe due to the increasing human pressure. Water degradation issue in Lake Biwa is taken as a research objective. Analytical study on photodegradation of pesticides flowing into Lake Biwa and the experimental study on the behavior of dissolved organic carbon and acid ions eluted from the sediment with pH change was conducted. Firstly a brief explanation on the study of pesticide is given below. It has been pointed out that that large quantity of pesticide has been utilized in the paddy field around Lake Biwa and those pesticides are observed to flow into the lake. Major removal processes of pesticide are such as attenuation by the rainfall, spillage and evaporation. However, it has been already proved that the removal of pesticide is largely related with the factors besides the rainfall. That is the removal of the pesticide by oxidizing and decomposing. Therefore, the photodegradation experiments on the pesticides were carried out and the ratio of decomposition was observed. Then the second research on the sediments are given below. It has been reported that in Europe, the acidification damage in the lakes and rivers due to the acid rain during 1960s. Especially negative impacts on the aquatic resources were severe. Thus the behavior of total organic carbon, phosphoric acid, dissolved silicon and dissolved vanadium in the sediment with varied pH in Lake Biwa was experimented.

2. Experiment

Six major types of pesticides flowing into Lake Biwa were used in this research. Each pesticide was solved in Milli-Q grade water, lake water and lake water added with potassium nitrate. This solution was used in the irradiation experiment with UV ray and the results were compared. Potassium nitrate was used as reagent having has the photosensitization effect. After comparing the results from experiments on photodegradation, the reaction pathway for each was discussed.

In the elution experiment from sediment, Milli-Q grade water or lake water was added to the sediment. Sample collected in Lake Biwa dissolved amount of organic carbon was measured by TOC meter in the samples. UV-VIS adsorptiometer was adopted when oxyacid ion was measured.

3. Result & Discussion

Only fenitrothion showed direct photodegradation phenomenon in 6 pesticides examined. Thiobencarb and bromobutide showed photosensitized degradation phenomenon.

In elution experiment from sediment, organic carbon dissolved into the aqueous phase at pH 13.0. Phosphoric and silicate concentrations in aqueous phase increased with pH in the range of pH 9.0 to 13.0 and pH 8.0 to 13.0, respectively. Vanadate concentration increased above pH 10.0 and was constant almost from pH 11.0 to 13.0.