PC7) Removal of Heavy Metals (Cd, Ni and Zn) in Synthetic Wastewater Using *Rodobacter spaeeroides*

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1. Introduction

Environmental pollutions caused by chemical pollutants, including nutrients and heavy metals, are currently a global issue. Recently, bioremediation by photosynthetic bacteria has attracted attention as a new cost-effective method that has been developed to remove contaminants from wastewater. These photosynthetic bacteria can be used for many types of wastewater treatment using the properties of various metabolic processes that can be grown in different environments. Among them, Purple Non-Sulfur Bacteria (PNSB) have a various growth modeling and the application in wastewater treatment which can reduce costs with the utilization of inorganic compounds as an electron donor. This study aimed to investigate the effect of heavy metals (Cd (II), Ni (II) and Zn (II)) on growth of *Rhodobacter sphaeroides*. In addition, the active and the passive removal of heavy metals by *R. sphaeroides* were examined.

2. Materials and Methods

The *Rhodobacter sphaeroides* (KCTC No. 1434) was inoculated by modified ATCC medium No. 1170. To investigate the effects of heavy metals on growth and bioremediation of heavy metals ions(Cd (II), Ni (II) and Zn (II)) by *R. sphaeroides*. In metabolic studies, there were two experiments. In the first experiment, the dead cells were prepared by treating 1M sodium azide (NaN$_3$) solution and compared with the live cells. In the second experiment, it was conducted in medium and distilled water as a comparison of growth by nutrients. The heavy metal concentrations were analyzed using inductively coupled plasma-optical emission spectroscopy (ICP-OES 8000, PerkinElmer, America). Also, the photosynthetic bacterial growth was monitored following the changes in the absorption at 535 nm and 650 nm. All analyses used Fischer's Least Significant Difference (LSD) test of SAS Version 8.2 (SAS Institute, Cary, NC, USA).

3. Results and Discussions

The growth rates of *Rhodobacter sphaeroides* tend to decrease as the concentration of heavy metals increased. The efficiency of removal by *R. sphaeroides* was in the order of Cd (II) > Ni (II) > Zn (II). Based on metabolic inhibition and metabolic-dependent studies, it was concluded that *R. sphaeroides* removed heavy metals using biosorption and also bioaccumulation. The metabolic inhibition and metabolic-dependent studies revealed that the processes of heavy metals removal by *R. sphaeroides* may involve intracellular uptake and surface binding.

4. References

Bai, H. J., Zhang, Z. M., Yang, G. E., Li, B. Z., 2008, Bioremediation of cadmium by growing *Rhodobacter sphaeroides*: kinetic characteristic and mechanism studies, Bioresource. Technol,., 99(16), 7716-7722.