Purification of seawater contaminated with undegradable aromatic ring compounds using ozonolysis followed by titanium dioxide treatment

Yoshitoshi Nakamura, Fumihisa Kobayashi, Masakazu Daidai, and Chikako Asada
Graduate School of Natural Science & Technology, Kanazawa University, Kakuma-machi, Kanazawa 920-1192, Japan

If wastewater discharged from homes and industry was treated by chemical or biological means and all of the chemical materials are kept back, only water is sent into the environment. However, a certain amount of the chemical materials flow into the environment along with wastewater. For example wastewater and also landfill are sources of harmful chemicals that pollute groundwater. Agricultural chemicals are also a major cause of groundwater pollution. Furthermore, some of the paints used on ships dissolve and pollute rivers and the sea. Therefore, it is desired to develop the efficient environmental remediation method of water systems contaminated with chemical compounds. In the treatments of water systems contained with chemical compounds, the treatment of water system containing aromatic ring compounds is one of the most annoying problems because they have complex chemical structures and make their degradation more difficult. Ozone is one of the chemical reagents capable of oxidizing a variety of organic compounds in aqueous solution. The ozonolysis followed by titanium dioxide treatment seems to be one of the most effective purification methods for the degradation of aromatic ring compounds in the water systems. In this work, phenolic compounds such as 2,4-D, 2,4,5-T, bisphenol A, and others in the water containing salt were treated with a combination of ozonolysis and titanium dioxide treatment for developing the novel treatment method of coastal zone contaminated with aromatic ring compounds. The effects of operational conditions, i.e. pH and temperature, on the degradation of aromatic ring compounds and the production of organic acids were examined experimentally in the ozonolysis of aromatic ring compounds. Next the titanium dioxide treatment was attempted for the effective degradation of low-molecular weight organic acids obtained from aromatic ring compounds by ozonolysis because the ozonolysis can degrade them hardly.