

プラズマ酸化多層カーボンナノチューブ/酸化鉄を用いた水溶液中セシウムイオンの吸着

Adsorption of Cesium Ions from Aqueous Solution by O₂-Plasma-Oxidized Multiwalled Carbon Nanotubes/Iron Oxides

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1. Introduction

The immobilization of long-lived radionuclides is an important goal in the disposal of radioactive nuclear wastes. The sorption and migration of radionuclides are important processes to the transport of radionuclides to the natural environment. Radionuclides of cesium produced by nuclear fission contain have a long live such as, ¹³⁷Cs (30y) and ¹³⁵Cs (2×105y).

In this work, we use the O₂ plasma to treat multiwalled carbon nanotubes/iron oxides magnetic composite surfaces. Then we use the O₂-plasma-oxidized MWCNTs/iron oxides magnetic composite (po-MWCNTs/iron oxides) as an adsorbent for the remove of Cs from aqueous solution. The effects of the pH value, ionic strength and humic acid were studied.

2. Experimental Results and Discussion

The po-MWCNTs/iron oxides is characterized by SEM, Raman spectroscopy, and XRD. The application for the removal of Cs⁺ from aqueous solutions was investigated by batch experiments. The Cs⁺ concentrations were measured by atomic absorption spectrophotometer.

The results of SEM image (Figure 1) showed that an entangled network of MWCNT with clusters of iron oxides attached to them. It indicated that iron oxides were successfully coated on the surface of MWCNTs to form MWCNT/iron oxides.

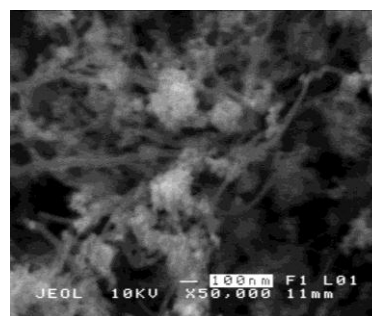


Figure 1. SEM images of po-MWCNTs/iron oxides.

Figure 2 shows the graphical representation of separation po-MWCNTs/iron oxides by using magnetic separation method. It can be seen that po-MWCNTs/iron oxides could be easily separated from the aqueous solution with few minutes by placing a permanent magnet. This experiment proved that po-MWCNTs/iron oxides possessed the properties of magnetism. Therefore, it can be used as a magnetic adsorbent to remove contaminants in liquid phase.



Figure 2 Photographs of Magnetic separation po-MWCNTs/iron oxides solution.