Journal of the Society for Remediation of Radioactive Contamination in the Environment Vol. 9, No. 1, pp.17-23 (2021)

Research Note

Effect of Atmospheric Pressure Non-Equilibrium Plasma Treatment of Activated Carbon and Bamboo Charcoal on Cesium Adsorption

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● **Summary** ● In recent years, the method of atmospheric pressure non-equilibrium plasma has emerged as a promising technique to improve the adsorption capacity of metal ions. With this technology, the adsorbent no longer has to be chemically treated for increasing the adsorption capacity; therefore, no wastewater is produced. Thus, the environmental impact of this technology is lower than that of chemical treatment. The objective of this study was to remove radioactive Cs^+, a serious problem in Fukushima, using plasma-treated activated carbon (AC) and bamboo charcoal (BC). After the plasma treatment of AC and BC which volume can be reduced by an incineration, the capacity of Cs^+ adsorption was investigated by batch adsorption experiments. The results showed that the amount of Cs^+ adsorption by AC increased after the plasma treatment. In particular, the Cs^+ adsorption capacity of AC treated with plasma irradiation for 60 min and at 15 kV increased by 7.9 times compared to that of untreated AC. In contrast, the Cs^+ adsorption capacity of BC treated under the same plasma conditions decreased. According to surface observations for AC and BC by field emission scanning electron microscopy (FE-SEM), the surface structure of plasma-treated AC was almost unchanged. On the other hand, the honeycomb structure on the surface of BC by the plasma treatment was significantly changed. It means that the capacity of Cs^+ adsorption did not improve because the acidic functional group contributing to Cs^+ adsorption did not form on the changed surface of BC. Thus, it was cleared that the plasma treatment for AC could increase Cs^+ adsorption capacity without change of the surface and without decreasing the surface area or pore volume.

Key Words: cesium removal, activated carbon, bamboo charcoal, atmospheric pressure non-equilibrium plasma, adsorption, acid functional group

Received March 13, 2020; Accepted October 29, 2020; Recommended by chairpersons in the 8th annual meeting of SRRCE

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