# Treatment of low level radioactive waste containing $^{134}Cs$ radionuclide using modified natural clay

**Sayed S. Metwally, Mahmoud G. Hamed, Emad H. Borai**

**Egyptian Atomic Energy Authority, Hot Labs. and Waste Management Center, 13759, Cairo, Egypt**

## ABSTRACT

Radioactive cesium is one of the nuclear fission products found in the radioactive waste that presents the most difficult challenges. Safe treatment of radioactive waste containing $^{134}Cs$ is the aim of this work. Hence, natural bentonite was modified using 8-Hydroxyquinoline as a chelating agent for the removal of $^{134}Cs$ radionuclide from aqueous solution for safe discharge and to protect human and the environment from the risk of waste containing radioactive cesium. Some parameters influencing the sorption process were investigated, including medium pH, contact time, cesium ion concentrations, and temperature. The adsorption was well described by the Langmuir sorption isotherm model at different temperatures. The maximum sorption capacity was 0.343 mmol/g. The applicability of Langmuir equation is strong evidence that the process is limited by a chemisorption mechanism. The comparison of sorption capacity of the used material with other sorbents in the literature indicated that the modified material has a much higher sorption capacity than many sorbents. Based on the findings, modified bentonite is a highly effective sorbent media and is advised for removing $^{134}Cs$ radionuclide from radioactive waste.

**Keywords:** Radioactive waste; bentonite; 8-Hydroxyquinoline; $^{134}Cs$; kinetics and equilibrium.