COMPLEXATION OF TECHNETIUM WITH HUMIC ACID

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^{99}Tc is one of the most important fission products which were released into the environment, due to its high fission yield (6 %) and long half-life (2.1×10^5 y). It is normally recognized that technetium easily moves in an aquifer system in the most stable chemical form of pertechnetate (TcO_4^-) under oxidative conditions. In reductive condition, however, pertechnetate would be reduced to form technetium dioxide as expected from the Eh-pH diagram [1]. The other important chemical reaction of the reduced technetium is the complexation with naturally occurring organic materials, such as humic acid or fulvic acid. This study aims at clarifying the reaction stoichiometry between technetium and humic acid in a macroscopic scale by using ^{99}Tc and to speciate the technetium species in microscopic scale by using ^{95m}Tc.

Humic acid (Gohy-573), used in this study, was obtained from one of the groundwaters at Gorleben, Germany, and was purified, characterized at the Institute for Radiochemistry, Technical University Munich [2].

1. Stoichiometrical investigation for Tc-HA complexation

The Tc-HA complexation was studied in a mixture solution of TcO_4^- (10^{-4} M) and HA (*ca.* 0.3 meq/L) by addition of Sn^{2+} as a reductant, under 0.1 M $NaClO_4$ (pH 4) [3]. The brownish black precipitate of Tc-HA complex was formed and the amount of Tc in the solution decreased with an increase of that of Sn^{2+} added. The color of the Tc-HA complex is similar to that of $TcO_2 \cdot nH_2O$ which is formed by Sn^{2+} reduction of pertechnetate in the absence of HA. The stability of the Tc-HA complex was, however, distinguished from the technetium dioxide at higher pH. It was found that technetium was released from the

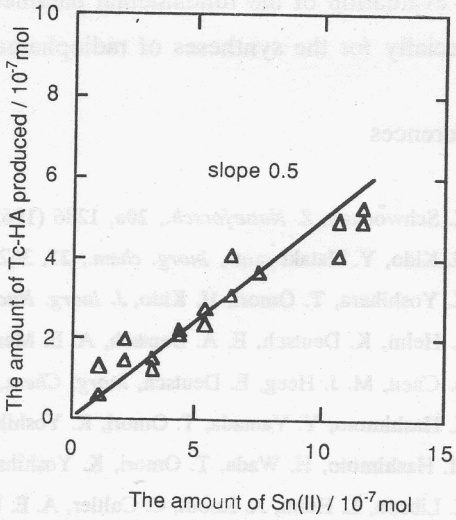

Fig.1. The Tc-HA complex formation by an addition of Sn(II).