



Contribution ID: 114

Type: Oral Presentation

Unusual redox neighborhood in technetium compounds

Thursday, 2 November 2017 16:45 (15 minutes)

Technetium has a great number of oxidation states (usually we say 9 but in fact much more) and is evidently one of the elements with the most complicated chemistry. This is due its position in the center of 4d elements row with 7 electrons available for chemical bonding. One of the very special options complicating technetium chemistry is its ability to cluster formation and especially the possibility for Tc cluster to be reduced by consecutive addition of electrons one by one. So the oxidation states of Tc in hydrochloric acid could be 4+ (in K_2TcCl_6), 3+ (in $[\text{Bu}_4\text{N}]\text{Tc}_2\text{Cl}_8$), 2.5+ (in $\text{K}_3\text{Tc}_2\text{Cl}_8$), 2+ (in $\text{K}_2\text{Tc}_2\text{Cl}_6$), 11/6+ (in $[\text{Me}_4\text{N}]\text{Tc}_6\text{Cl}_{14}$ and 10/6+ (in $[\text{Me}_4\text{N}]\text{Tc}_6\text{Cl}_{12}$). We could imagine the number of hydroxides that could be formed starting from these compounds. Another option is the presence of Tc atoms in different oxidation states within the same compound (p.e. Tc_2Ac_4 where Tc^{3+} and Tc^{7+} coexist in the one compound. New example is the red pertechnic acid. According to new synthesis and X ray structure study it contains 4 TcO_6 octahedra with Tc^{6+} , that is usually considered extremely unstable and 16 Tc(VII) tetrahedra arranged in a joint compound $[\text{TcVI}_4\text{TcVII}_{16}]\cdot 16\text{H}_2\text{O}$: $a = 11.1743(6)$, $b = 12.8839(6)$, $c = 14.0661(6)$ Å, $\alpha = 71.128(2)^\circ$, $\beta = 69.015(2)^\circ$, $\gamma = 74.340(2)^\circ$, $P = 1$, $Z = 1$. Of next extreme interest is new $\text{Pu(III)(DMSO)}_6[\text{TcO}_4]_3$ compound where reducing and oxidizing parts coexist.

Primary author: Prof. GERMAN, Konstantin (A.N.Frumkin Institute of Physical Chemistry and Electrochemistry of Russian Academy of Sciences)

Co-authors: Prof. FEDOSSEEV, Alexander ((A.N.Frumkin Institute of Physical Chemistry and Electrochemistry of); Dr AFANASIEV, Andrey (A.N.Frumkin Institute of Physical Chemistry and Electrochemistry of Russian Academy of Sciences); Prof. GRIGORIEV, Mikhail ((A.N.Frumkin Institute of Physical Chemistry and Electrochemistry of Russian Academy of Sciences)

Presenter: Prof. GERMAN, Konstantin (A.N.Frumkin Institute of Physical Chemistry and Electrochemistry of Russian Academy of Sciences)

Session Classification: Special topic on Tc and Re