Transition metal chemistry with special emphasis on Technetium

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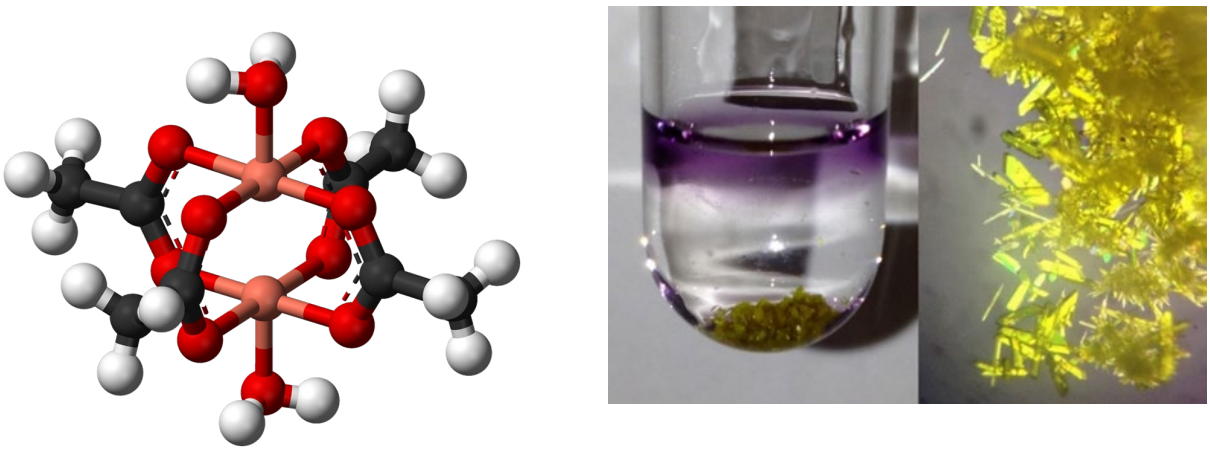
Transition metals belong to the most important elements in the periodic table. These metals include 30 elements of the *d*-block ("outer transition metals") and 28 metals of the *f*-block ("inner transition metals"). Due to the different nature of *d*- and *f*-electrons, respectively, the properties of *d*- and *f*-block compounds are not comparable.
In the first part of the lecture we will explain how the electronic situation of transition metals has to be described (orbitals, term symbols), and how the electronic situation changes if compounds are formed (crystal field and ligand field theory). The photophysical and magnetic properties arising from different electronic structures will be discussed. Furthermore, several applications based on these properties will be shown.
Special emphasis will be put on the element technetium. It is placed in the middle of the *d*-block but, nevertheless, only radioactive isotopes of this element are known, a curiosity for an element with a low ordering number (43). It will be discussed which isotopes are known, how they can be prepared and which role technetium plays in different chemical disciplines, in analytics, radiopharmacy, and which role technetium plays in the nuclear fuel cycle and the environment.



Typical paddle-wheel type complex of transition metals with chelating ligands (left) and appearance of technetium compounds in strong acid (right)