Abstract

The oxidation state is a central concept in chemistry [1]. Many of physicochemical properties of chemical molecules and materials are related to the trend of oxidation states of elements. The highest known oxidation state in the Periodic Table is +VIII for neutral compounds, as exemplified in tetra-oxides MO₄ (M = Ru, Os, Ir, Xe) and +IX in IrO₄⁺ cation [2]. The highest known oxidation state of the whole lanthanide series is +IV for Ce, Pr, Nd, Tb, and Dy, and +VII for Np for actinides. We have recently shown that +V oxidation state and pentavalent state are viable for lanthanide elements [3]. An overview of the periodic trend of the oxidation states of chemical elements in the Periodic Table will be presented in this talk [4]. The implications of these trends for rational design of materials will be discussed.