

## The Periodicity and General Trend of the Oxidation State in Chemistry

by Professor Jun Li

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Host: Asst. Prof. Lu Jiong

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### About Professor Jun Li



Professor Li is a theoretical and computational chemist. He received a PhD in Chinese Academy of Sciences in 1992 and did postdoctoral research in Germany and USA. He then worked in the Pacific Northwest National Laboratory, USA for over ten years as a senior research scientist and chief scientist. He joined Tsinghua University as a ChangJiang Chair Professor in 2009 and is an elected AAAS Fellow. Prof. Li is currently the director of the Theoretical Chemistry Center, Tsinghua University. He works in the fields of theoretical heavy-element chemistry, computational catalysis, and cluster science with ~350 publications and ~20,000 citations.

### 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 tetraoxides  $\text{MO}_4$  ( $\text{M} = \text{Ru}, \text{Os}, \text{Ir}, \text{Xe}$ ) and +IX in  $\text{IrO}_4^+$  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.