

# **The Understanding of Fundamental Principles of Synthetic and Biological Catalysis: Designing of New and More Efficient Catalyst.**

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First part of this talk addresses in depth fundamental issues of designing new catalysts and materials with unusual physico-chemical properties and reactivity. As an example, it addresses metal oxide cluster anions (polyoxometalates or "POMs")-based unprecedented late-transition-metal-oxo species [involving Pt(IV)=O, Pd(IV)=O and Au(III)=O units], and new organic oxidation catalyst as di-transition-metal substituted-gamma-Keggin POMs. It also elucidates the fundamental principles of dinitrogen hydrogenation. Second part of this talk addresses mechanism of glutathione peroxidase activity of Se-proteins. Understanding of the functions of these enzymes, the mechanisms of their actions, and their tissues distributions are critical for designing of Se-based anti-cancer drugs, targeting the specific tissues, and Se distribution in the body.