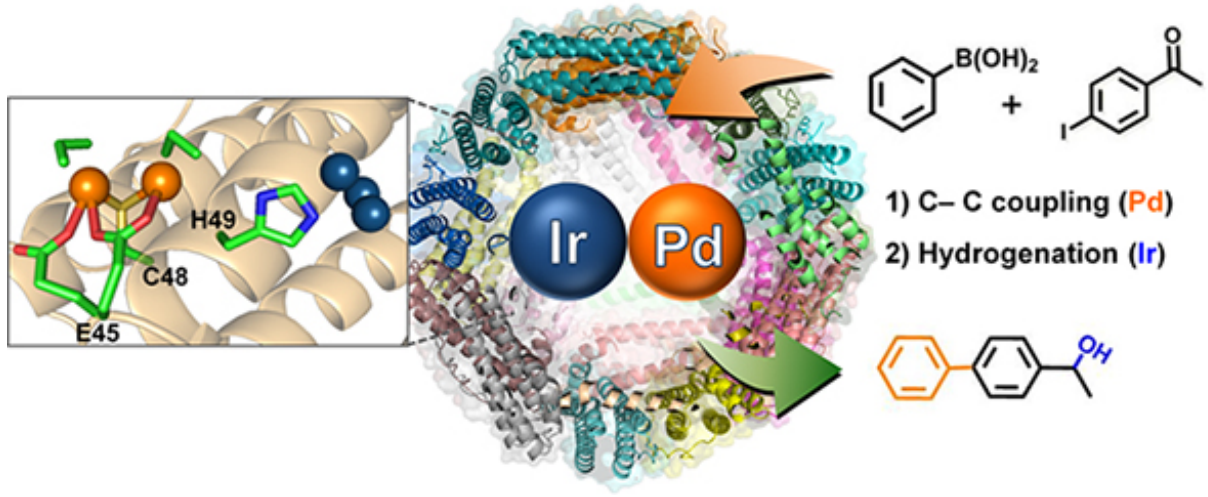
Protein cages for designing various catalytic reactions

August 30 2016



Schematic representation showing the crystal structure and catalytic reactions of apo-ferritin cage containing both Ir and Pd complexes. Credit: Tokyo Institute of Technology

Compartmentalization is a common strategy used by living organisms to create isolated reaction environments to protect reaction catalysts from undesired reaction partners in cells. Mimicking such compartment systems is a novel approach for developing new biohybrid materials as well as for understanding the complex cellular processes.

Recently, the Ueno group at Tokyo Tech has developed a new strategy in

which two different organometallic iridium (Ir) and palladium (Pd) metal complexes are immobilized into a single protein cage of apo-ferritin to construct a protein-based microcompartment.

The composite was prepared by the stepwise incorporation of Ir complex followed by introduction of Pd complex in buffer solution. The resulting protein composite was purified, crystallized, and characterized by X-ray crystallography.

The X-ray crystal structure analysis revealed that the Ir and Pd metal complexes have different binding preferences and to exist simultaneously inside the single protein cage. Notably, both the metal complexes are catalytically active and can promote cascade reactions such as Ir catalyzed hydrogenation and Pd catalyzed Suzuki-Miyaura cross-coupling reactions simultaneously inside the cage while keeping the entire cage structure intact.

The findings show that the concept of incorporating multiple metal catalysts into a single cage is promising for developing protein-based microcompartments and biomimetic materials for catalytic applications.

More information: Basudev Maity et al. Immobilization of two organometallic complexes into a single cage to construct protein-based microcompartments, *Chem. Commun.* (2016). DOI: 10.1039/C6CC00679E

Provided by Tokyo Institute of Technology