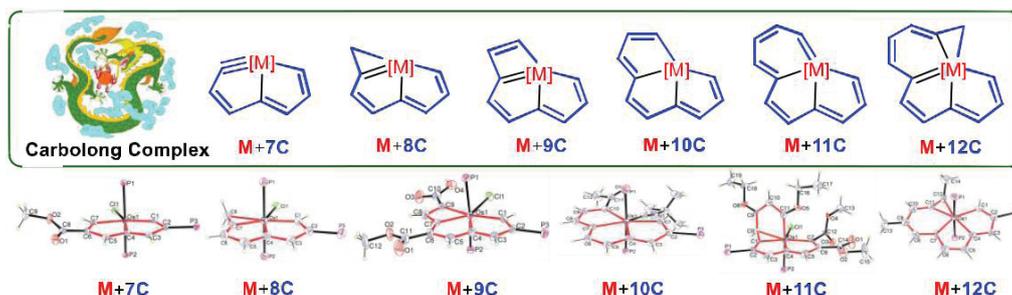


## Carbolong Chemistry: A Novel $\pi$ -Conjugated System

Haiping Xia

Xiamen University, China

The formation of metal-carbon bonds is a fundamental principle in organometallic chemistry. Construction of organometallics with more than two metal-carbon  $\sigma$  bonds remains a great challenge. Recently, we reported a novel organometallic complex, metallapentalyne, containing three metal-carbon  $\sigma$  bonds in the equatorial plane. X-ray study reveals that the carbyne angle is only  $129.5^\circ$ , which is the smallest carbyne angles observed thus far. Theoretical study shows that it is the first example of planar Möbius aromatic species. Metallapentalyne formally consists of a seven-atoms carbon chain and a transition metal (**M+7C**). Thereafter, with the extension of this carbon chain (ranging from seven atoms to twelve atoms), a series carbon-based polydentate organometallics (**M+8C** to **M+12C**) chelates containing four or five metal-carbon bonds were synthesized. For all of these complexes, the binding atoms, even the backbones are carbon atoms. These carbon-based polydentate chelates are named as “carbolong complexes”. A number of exceptional organometallic complexes delineated in this work. For example, **M+8C** represents the first example of  $\sigma$ -aromaticity in an unsaturated three-membered ring; **M+10C** is the first metal-bridged tricyclic aromatic system, in which the metal center is shared by three aromatic five-membered rings; **M+12C** represents the upper limit of coordination number of a metal atom bonding with carbon ligands in a planar geometry.



In general, organometallic complexes are highly sensitive towards air, water and heat. However, these new metallacycles exhibit remarkable stability, which can even be stable at  $100^\circ\text{C}$  in air. Unique properties, such as aggregation induced emission enhancement, large Stokes shifts and long lifetime (*Nat. Chem.* **2013**, 5, 698) broad absorption from the ultraviolet-visible to the near-infrared region (*Angew. Chem. Int. Ed.* **2015**, 54, 6181) and excellent photoacoustic and photothermal properties (*Sci. Adv.* **2016**, 2, e1601031) have been demonstrated. Application of these carbonlong complexes on biomedicine and solar energy utilization is in progress in our laboratory.

### Biography:

Dr. Haiping Xia was worked in Department of Chemistry, Xiamen University from 1999–2018. He has been Chair, Professor in Department of Chemistry, Southern University of Science and Technology from 2018-Present.