

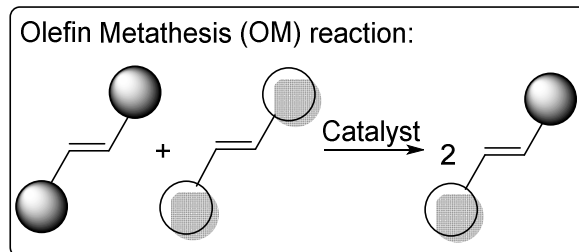
# Science and Technology Group Annual Report FY2018

Satoshi Takebayashi  
Science and Technology Associate

## 1 Introduction

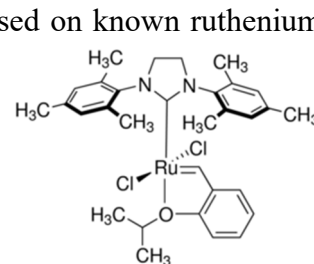
The olefin metathesis reaction is among the most widely applicable catalytic reactions for carbon-carbon double bond formation. Currently, molybdenum- and ruthenium-carbene catalysts are the most common choices for this reaction. It has been anticipated that base metal catalyst would be a desirable economical and biocompatible substitute of the ruthenium-catalysts.

*In this project, we are going to develop such base metal catalyzed olefin metathesis reactions using manganese organometallic complexes.* This project is funded by KAKENHI early-career scientists program, project number 18K14230, from FY2018 to FY2020.



## 2 Activities and Findings

At the onset of this project, manganese (Mn) catalyst was designed based on known ruthenium-carbene catalysts (right figure). The most common  $d^6$  Mn (I) precursor,  $\text{MnBr}(\text{CO})_5$ , was chosen as a starting point to synthesize a  $d^6$  Mn(I) carbene complex that is isoelectronic to  $d^6$  Ru(II) carbene complexes. Several Mn(I) complexes and a Mn(I) carbene complex were prepared, however none of these complexes were active towards olefin metathesis reaction.



Next, Mn complexes were designed based on iron olefin metathesis catalysts developed by Takebayashi *et al.* (under revision). This strategy enabled us to discover the first manganese catalyzed olefin metathesis reactions. ICP-MS analysis of trace transition metal impurities in the manganese complex further confirmed that this reaction is truly catalyzed by the manganese complex. Mechanistic investigation as well as a scope of the Mn catalysis is being carried out in my laboratory. The result of this research will be published in FY2019.

## 3 Collaborations

This research was carried out by corroboration with

- Mr. Sebastien Lapointe (Coordination Chemistry and Catalysis Unit, OIST)  
Single crystal X-ray crystallography analysis
- Dr. Robert Fayzullin (Arbuzov Institute of Organic and Physical Chemistry, FCR Kazan Scientific Center, Russian Academy of Sciences)  
Single crystal X-ray crystallography analysis
- Dr. Yoshiteru Iinuma (Instrumental Analysis Section, OIST)  
ICP-MS analysis

## 4 Publications and other output

This project is funded by KAKENHI early-career scientists program, project number 18K14230.  
URL: <https://kaken.nii.ac.jp/grant/KAKENHI-PROJECT-18K14230/>