Homogeneous Catalysts

The catMETium® RF Catalyst Family for royalty-free metathesis

Introduction

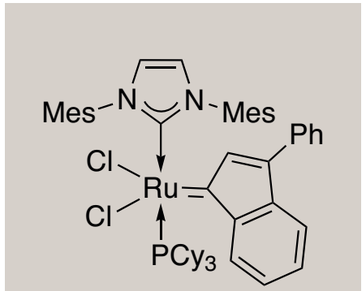
Evonik offers metathesis catalysts under the brand catMETium®, identifying the most cost effective, productive and robust homogeneous catalyst required for your reaction. Areas of application include high tech plastics, including those based on renewable resources, or active ingredients for the pharmaceutical and agricultural industries.

Metathesis reactions with catMETium®:

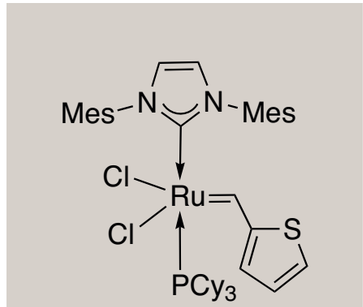
- Cross metathesis
- Ring-closing metathesis
- Ring-opening metathesis polymerization

The Products in Brief

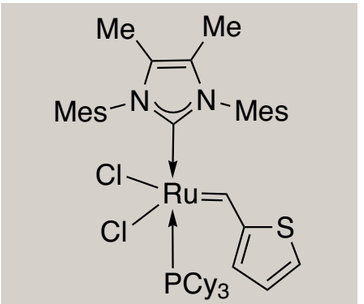
Well-defined ruthenium carbene complexes have found extensive applications in various complex organic syntheses, such as APIs or the production of oleo based products. The advantage of these complexes is that they combine high activity with excellent tolerance towards many functional groups.
The catalysts all share the characteristics of having high thermal stability and significant tolerance toward oxygen and moisture.



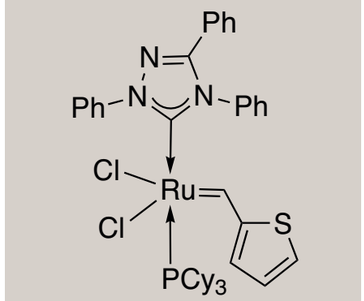
catMETium® RF1



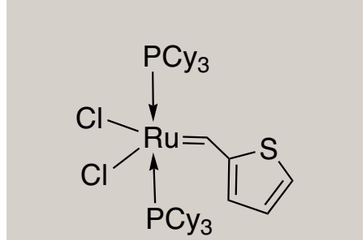
catMETium® RF2



catMETium® RF3



catMETium® RF4



catMETium® RF5

References
R. Kadyrov Chem. Eur. J. 2013, 19, 1002 – 1012
R. Kadyrov, C. Azap. S. Weidlich, D. Wolf,
Top. Catal, 2012, 55, 538-542.
C. Dumrath, A. Dumrath, H. Neumann, M. Beller,
R. Kadyrov, ChemCatChem, 2014, 6, 3101-3104.

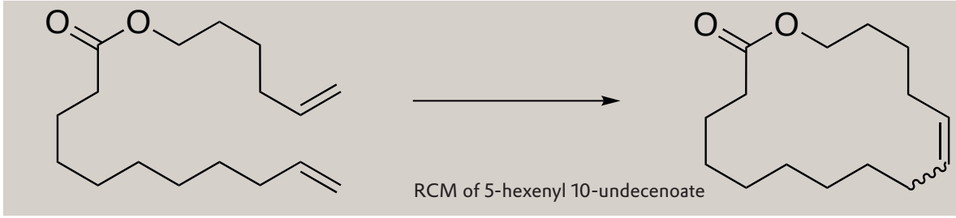
Product Characteristics

Product	catMETium® RF1	catMETium® RF2	catMETium® RF3	catMETium® RF4	catMETium® RF5
Formula	$C_{54}H_{67}Cl_2N_2PRu$	$C_{44}H_{61}Cl_2N_2PRuS$	$C_{46}H_{65}Cl_2N_2PRuS$	$C_{43}H_{52}Cl_2N_3PRuS$	$C_{41}H_{70}Cl_2P_2RuS$
Color and Form	Orange brown powder	Violet brown powder	Violet brown powder	Brown powder	Violet to brown powder
Application	For use in pharmaceutical application only. Uses other than pharmaceutical applications are not authorized	No limitations in application fields	No limitations in application fields	No limitations in application fields	No limitations in application fields

Selected Benefits

High Turnover Number (TON) and Turnover Frequency (TOF)

The synthesis of macrolides by the macrocyclization of 1, ω-dienyl esters has attracted considerable attention because they are present in many natural products and drugs. High TON and TOF can be achieved in the RCM reaction of 5-hexenyl-10-undecenoate using catMETium® RF2 at loadings as low as 50 ppm.



RCM of 5-hexenyl 10-undecenoate

With only 25–250 ppm of catMETium® RF catalysts are required to reach near-complete conversion into a broad variety of 5–16-membered heterocyclic compounds.

Highly prized robustness and thermal stability at elevated temperatures

The thermal stability of catMETium® RF catalysts represents another advantage, especially important in equilibrium-limited cross-metathesis or homo-metathesis, e.g. in the conversion of natural products into high-value functional chemicals as in the homometathesis of methyl oleate. This allows for the combining of the catalytic metathesis step with thermal separation and to return non-converted starting materials to the process.

The Business Model in Brief

Simple pricing structure
- RF = Royalty-free metathesis
- No license agreements are required
- Evonik technology is priced on a cost per unit (€/kg) basis.

Strong and clear IP position
- Evonik's IP portfolio contains the patents for composition of matter and synthetic routes. This is vital for customers who want to be clear on the patent position of their catalyst partner.

No quantity restrictions
- Evonik has the necessary internal production capabilities on lab, pilot and commercial scales.
  There are no restrictions on purchase quantities.

Samples
- For research purposes samples of the new catMETium® metathesis catalysts can be obtained from Strem Chemicals at www.strem.com.
  Evonik offers catMETium® directly in commercial quantities for your applications.