

REFERENCES

- Antiñolo, A. A., Carrillo-Hermosilla, F., Corrochano, A., Fernández-Baeza, J., Lara-Sánchez, A. R., Ribeiro, M., Lanfranchi, M. A., Otero, M., Pellinghelli, A., Portela, M. F. and Santos, J. V. (2000) Synthesis of Zirconium(IV) Monocyclopentadienyl-Aryloxy Complexes and Their Use in Catalytic Ethylene Polymerization. X-ray Structure of $(\eta^5\text{-C}_5\text{Me}_5)\text{Zr}\{2,6\text{-OC}_6\text{H}_3(\text{CH}_3)_2\}_3$. *Organometallics*, 19, 2837-2843.
- Altamura, P. and Grassi, A. (2001) Crystalline Alternating Sequences Identified in Ethylene-*co*-norbornene Polymers Produced by the $(\eta^5\text{-C}_2\text{B}_9\text{H}_{11})\text{Zr}(\text{NEt}_2)_2(\text{NHEt}_2)\text{-Al}'\text{Bu}_3$ Catalyst. *Macromolecules*, 34, 9197-9200.
- Arnold, M., Bornemann, S., Schimmel, T. and Thomas, H. (2002) Modified Polypropylenes by Copolymerization with Nonconjugated Dienes and Additional Chemical Reactions. *Macromolecular Symposia*, 181(1), 5–16
- Arnold, M., Reussner, J., Utschick, H. and Fischer, H. (1994) Synthese und Charakterisierung von Butadien/Ethen/Propen Terpolymeren. *Macromolecular Chemistry and Physics*, 195(7), 2653-2661.
- Beer, S.; Brandhorst, K.; Grunenberg, J.; Hrib, C. G.; Jones, P. G.; Tamm, M. (2008) Preparation of Cyclophanes by Room-Temperature Ring-Closing Alkyne Metathesis with Imidazolin-2-iminato Tungsten Alkylidyne Complexes. *Organic Letters*, 10, 981-984.
- Beer, S., Brandhorst, K., Hrib, C. G., Wu, X., Haberlag, B., Grunenberg, J., Jones, P. G. and Tamm, M. (2009) Experimental and Theoretical Investigations of Catalytic Alkyne Cross-Metathesis with Imidazolin-2-iminato Tungsten Alkylidyne Complexes. *Organometallics*, 28, 1534-1545.
- Beer, S., Hrib, C. G., Jones, P. G., Brandhorst, K., Grunenberg, J. and Tamm, M. (2007) Efficient Room-Temperature Alkyne Metathesis with Well-Defined Imidazolin-2-iminato Tungsten Alkylidyne Complexes. *Angewandte Chemie International Edition*, 46, 8890-8894.
- Beer, S., Hrib, C. G., Jones, P. G., Brandhorst, K., Grunenberg, J. and Tamm, M. (2007) Effiziente Alkinmetathese bei Raumtemperatur mit wohldefinierten

- Imidazolin-2-iminato-Alkylidinwolframkomplexen. Angewandte Makromolekulare Chemie, 119, 9047-9051.
- Braunschweig, H. and Breitling, F. M. (2006) Constrained Geometry Complexes - Synthesis and Applications. Coordination Chemistry Reviews, 250, 2691-2720.
- Brintzinger, H. H., Fischer, D., Mülhaupt, R., Rieger B. and Waymouth, R. M. (1995) Stereospecific Olefin Polymerization with Chiral Metallocene Catalysts. Angewandte Chemie International Edition in English, 34, 1143-1170.
- Busico, V. (2009) Metal-catalysed Olefin Polymerisation into the New Millennium: A Perspective Outlook. Dalton Transactions, 8794-8802
- Cai, Z., Nakayama, Y. and Shiono, T. (2006) Living Random Copolymerization of Propylene and Norbornene with *ansa*-Fluorenylamidodimethyltitanium Complex: Synthesis of Novel Syndiotactic Polypropylene-*b*-poly(propylene-*ran*-norbornene). Macromolecules, 39, 2031-2033
- Cano J. and Kunz K. (2007) How to Synthesize a Constrained Geometry Catalyst (CGC) – A survey. Journal of Organometallic Chemistry, 692, 4411-4423.
- Caporaso, L.; Iudici, N.; Oliva, L. (2006) A Novel Route to Graft-Copolymers with Tailored Structures for the Compatibilization of Polymeric Blend. Macromolecular Symposia, 234(1), 42-50.
- Carpenetti, D. W., Kloppenburg, L., Kupec, J. T. and Petersen, J. L. (1996) Application of Amine Elimination for the Efficient Preparation of Electrophilic *ansa*-Monocyclopentadienyl Group 4 Complexes Containing an Appended Amido Functionality. Structural Characterization of $[(C_5H_4)SiMe_2(N-t-Bu)]ZrCl_2(NMe_2H)$. Organometallics, 15, 1572-1581.
- Cherdron, H., Brekner, M. -J. and Osan, F. (1994) Cycloolefin-Copolymere: Eine neue Klasse Transparenter Thermoplaste. Angewandte Makromolekulare Chemie, 223, 121-133.
- Cheung, Y. W. and Guest, M. J. (2000) A Study of the Blending of Ethylene-Styrene Copolymers Differing in the Copolymer Styrene Content: Miscibility

- Considerations. Journal of Polymer Science Part B: Polymer Physics, 38(22), 2976-2987.
- Chien, J. C. W. and He, D. (1991) Olefin Copolymerization with Metallocene Catalysts. IV. Metallocene/Methylaluminoxane Catalyzed Olefin Terpolymerization. Journal of Polymer Science Part A: Polymer Chemistry, 29(11), 1609-1613.
- Chung, T. C. and Dong, J. Y. (2001) A Novel Consecutive Chain Transfer Reaction to *p*-Methylstyrene and Hydrogen during Metallocene-Mediated Olefin Polymerization. Journal of American Chemical Society, 123(21), 4871-4876.
- Davis, T. A catalyst for change —A Look at Olefin Polymerization Catalysts Past, Present, and Future, KnowledgeLink Newsletter from Thomson Scientific Website, www.thomsonscientific.com/newsletter
- Dias, A. R., Duarte, M. T., Fernandes, A. C., Fernandes, S., Marques, M. M., Martins, A. M., Da Silva, J. F. and Rodrigues, S. S. (2004) Titanium Ketimide Complexes as α -Olefin Homo- and Copolymerisation Catalysts. X-ray diffraction structures of $[TiCp(N=C'Bu_2)Cl_2]$ ($Cp=Ind, Cp^*$). Journal of Organometallic Chemistry, 689, 203-213.
- Doherty, S., Errington, R. J., Jarvis, A. P., Collins, S., Clegg, W. and Elsegood, M. R. J. (1998) Polymerization of Ethylene by the Electrophilic Mixed Cyclopentadienylpyridylalkoxide Complexes $[CpM\{NC_5H_4(CR_2O)-2\}Cl_2]$ ($M = Ti, Zr, R = Ph, Pr^I$). Organometallics, 17, 3408-3410.
- Dragutan, V., Streck, R. (2000) Catalytic Polymerisation of Cycloolefins. Studies in Surface Science and Catalysis, vol 131, Elsevier: Amsterdam.
- Ferreira, M. J. and Martins, A. M. (2006) Group 4 Ketimide Complexes: Synthesis, Reactivity and Catalytic Applications. Coordination Chemistry Review, 250, 118-132.
- Gerum, W., Höhne, G. W. H., Wilke, W., Arnold, M. and Wegner, T. (1996) Hydrogenated Butadiene/Ethene/1-Olefin Terpolymers as Model Substances for Short-chain Branched Polyethylene. Macromolecular Chemistry and Physics, 197(5), 1691-1712.

- Glöckner, A., Bannenberg, T., Daniliuc, C. G., Jones, P. G. and Tamm, M. (2012) From a Cycloheptatrienylzirconium Allyl Complex to a Cycloheptatrienylzirconium Imidazolin-2-iminato “Pogo Stick” Complex with Imido-Type Reactivity. *Inorganic Chemistry*, 51(7), 4368-4378.
- Haberlag, B., Wu, X., Brandhorst, K., Grunenberg, J., Daniliuc, C. G., Jones, P. G. and Tamm, M. (2010) Preparation of Imidazolin-2-iminato Molybdenum and Tungsten Benzylidyne Complexes: A New Pathway to Highly Active Alkyne Metathesis Catalysts. *Chemistry – A European Journal*, 16(29), 8868-8877.
- Harrington, B. A. and Crowther, D. J. (1998) Stereoregular, Alternating Ethylene–Norbornene Copolymers from Monocyclopentadienyl Catalysts Activated with Non-coordinating Discrete Anions. *Journal of Molecular Catalysis A: Chemical*, 128, 79-84.
- Hasan, T., Ikeda T. and Shiono, T. (2004) Ethene–Norbornene Copolymer with High Norbornene Content Produced by *ansa*-Fluorenlylamidodimethyltitanium Complex Using a Suitable Activator. *Macromolecules*, 37(23), 8503-8509.
- Hasan, T., Ikeda T. and Shiono, T. (2005) Random Copolymerization of Propene and Norbornene with *ansa*-Fluorenlylamidodimethyltitanium-Based Catalysts. *Macromolecules*, 38(4), 1071-1074.
- Herwig, J. and Kaminsky, W. (1983) Halogen-free Soluble Ziegler Catalysts with Methylalumoxan as Catalyst. *Polymer Bulletin*, 9, 464-469.
- Hung, J. and Waymouth, R. M. (2005) Unconstrained Geometry Complexes: Ethylene/α-olefin Copolymerizations with a Tetramethyldisilyl-bridged Cp-amido Titanium Complex. *Journal of Polymer Science Part A: Polymer Chemistry*, 43(17), 3840-3851.
- Itagaki, K., Fujiki, M. and Nomura, K. (2007) Effect of Cyclopentadienyl and Anionic Donor Ligands on Monomer Reactivities in Copolymerization of Ethylene with 2-Methyl-1-pentene by Nonbridged Half-Titanocenes–Cocatalyst Systems. *Macromolecules*, 40(18), 6489-6499.
- Itagaki, K., Hasumi, S., Fujiki, M. and Nomura, K. (2009) Ethylene Polymerization and Ethylene/1-octene Copolymerization using Group 4 Half-metallocenes

- Containing Aryloxo Ligands, $\text{Cp}^*\text{MCl}_2(\text{OAr})$ [$\text{M} = \text{Ti}, \text{Zr}, \text{Hf}$; $\text{Ar} = \text{O}-2,6-\text{R}_2\text{C}_6\text{H}_3$, $\text{R} = {'}\text{Bu}, \text{Ph}$]—MAO Catalyst Systems. *Journal of Molecular Catalysis A: Chemical*, 303, 102-109.
- Kakinuki, K., Fujiki, M. and Nomura, K. (2009) Copolymerization of Ethylene with α -Olefins Containing Substituents Catalyzed by Half-Titanocenes: Factors Affecting the Monomer Reactivities. *Macromolecules*, 42(13), 4585-4595.
- Kaminsky, W. (1981) Neues über Ziegler–Natta–Katalyse. *Nachrichten aus Chemie, Technik und Laboratorium*, 29(6), 373-377.
- Kaminsky, W. (1994) Olefinpolymerisation Mittels Metallocenkatalysatoren. *Angewandte Makromolekulare Chemie*, 223(1), 101-120.
- Kaminsky W. and Arndt, M. (1997) Metallocenes for Polymer Catalysis. *Advances in Polymer Science*, 127, 143-187.
- Kaminsky, W., Beulich I. and Arndt-Rosenau, M. (2001) Copolymerization of Ethene with Cyclic and Other Sterically Hindered Olefins. *Macromolecular Symposia*, 173(1), 211-226.
- Kaminsky, W., Miri, M., Sinn, H. and Woldt, R. (1983) Bis(cyclopentadienyl) zirkon-verbindungen und aluminoxan als Ziegler-Katalysatoren für die polymerisation und copolymerisation von olefinen. *Makromolekulare Chemie Rapid Communications*, 4(6), 417-421.
- Khan, F. Z., Kakinuki, K. and Nomura, K. (2009) Copolymerization of Ethylene with *tert*-Butylethylene Using Nonbridged Half-Titanocene-Cocatalyst Systems. *Macromolecules*, 42 (11), 3767-3773.
- Kissin, Y. V. (1985) Isospecific Polymerization of Olefin with Heterogeneous Ziegler-Natta Catalysts. *Springer-Verlag: New York*, 9, p 3
- Koivumäki, J. and Seppälä, J. V. (1994) Observations on the Synergistic Effect of Adding 1-Butene to Systems Polymerized with $\text{MgCl}_2/\text{TiCl}_4$ and Cp_2ZrCl_2 Catalysts. *Macromolecules*, 27, 2008-2012.
- Kretschmer, W. P., Dijkhuis, C., Meetsma, A., Hessen, B. and Teuben, J. H. (2002) A Highly Efficient Titanium-based Olefin Polymerisation Catalyst with a Monoanionic Iminoimidazolidide π -Donor Ancillary Ligand. *Chemical Communications*, 608-609.

- Kunz, K., Erker, G., Döring, S., Bredeau, S., Kehr, G. and Fröhlich, R. (2002) Formation of $\text{sp}^3\text{-C}_1$ -Bridged Cp/Amido Titanium and Zirconium “CpCN” Constrained-Geometry Ziegler–Natta Catalyst Systems. Organometallics, 21(6), 1031-1041.
- Kunz, K., Erker, G., Kehr, G., Fröhlich, R., Jacobsen, H., Berke, H. and Blacque, O. (2002) Syntheses and Ethylene (Co)polymerisation with Cyclodimeric ($\text{sp}_2\text{-C}_1$)-bridged Cp/-oxido Group 4 Metal Complexes. Journal of American Chemical Society, 124, 3316.
- Li, X.-F., Dai, K., Ye, W.-P., Pan L. and Li, Y.-S. (2004) New Titanium Complexes with Two β -Enaminoketonato Chelate Ligands: Syntheses, Structures, and Olefin Polymerization Activities. Organometallics, 23(6), 1223-1230.
- Liu, J. and Nomura, K. (2007) Highly Efficient Ethylene/Cyclopentene Copolymerization with Exclusive 1,2-Cyclopentene Incorporation by (Cyclopentadienyl)(ketimide)titanium(IV) Complex–MAO Catalysts. Advanced Synthesis and Catalysis, 349, 2235-2240.
- Liu, J. and Nomura, K. (2008) Efficient Functional Group Introduction into Polyolefins by Copolymerization of Ethylene with Allyltrialkylsilane Using Nonbridged Half-Titanocenes. Macromolecules, 41(4), 1070-1072.
- Makio, H. and Fujita, T. (2012) Special Edition for the 20th Anniversary of Publication of “Annual Survey of Catalytic Science and Technologies” - Recent Trends in Olefin Polymerization Catalyst Development, The Catalysis Society of Japan, p. 38.
- Mani, P. and Burns, C. M. (1991) Homo- and Copolymerization of Ethylene and Styrene Using Titanium Trichloride (AA)/Methylaluminoxane Macromolecules, 24(19), 5476-5477.
- Martins, A. M., Marques, M. M., Ascenso, J. R., Dias, A. R., Duarte, M. T., Fernandes, A. C., Fernandes, S., Ferreira, M. J., Matos, I., Oliveira, M. C., Rodrigues, S. S. and Wilson, C. (2005) Titanium and Zirconium Ketimide Complexes: Synthesis and Ethylene Polymerisation Catalysts. Journal of Organometallic Chemistry, 690(4), 874-884.

- Marques, M., Yu, Z., Rausch, M. D. and Chien, J. C. W. (1995) Olefin Terpolymerizations. II. 4-Vinylcyclohexene and Cyclooctadiene. Journal of Polymer Science Part A: Polymer Chemistry, 33(16), 2787-2793.
- Mathers, R. T. and Coates, G. W. (2004) Cross Metathesis Functionalization of Polyolefins. Chemical Communications, 4, 422–423.
- McMeeking, J., Gao, X., Spence, R. E. v. H., Brown, S. J. and Jeremic, D. (2000) USP 6114481.
- McKnight, A. L., Masood, M. A. and Waymouth, R. M. (1997) Selectivity in Propylene Polymerization with Group 4 Cp-Amido Catalysts. Organometallics, 16(13), 2879-2885
- McKnight, A. L. and Waymouth, R. M. (1998) Group 4 *ansa*-Cyclopentadienyl-Amido Catalysts for Olefin Polymerization. Chemical Reviews, 98(7), 2587-2598.
- McKnight, A. L. and Waymouth, R. M. (1999) Ethylene/Norbornene Copolymerizations with Titanium CpA Catalysts. Macromolecules, 32(9), 2816-2825.
- Nomura, K. (2008) Feature Article for Synthesis of Cyclic Olefin Copolymers. Chinese Journal of Polymer Science, 26, 513-651.
- Nomura, K. (2009) Half-titanocenes Containing Anionic Ancillary Donor Ligands as Promising New Catalysts for Precise Olefin Polymerisation. Dalton Transactions, 41, 8811-8823.
- Nomura, K. (2010) Syndiospecific Styrene Polymerization and Ethylene/Styrene Copolymerization Using Half-Titanocenes: Ligand Effects and Some New Mechanistic Aspects. Catalysis Surveys from Asia, 14, 33-49.
- Nomura, K. (2010) Syndiotactic Polystyrene - Synthesis, Characterization, Processing, and Application. Schellenberg, J., John Wiley & Sons, Eds., Inc., New Jersey, p. 60-91.
- Nomura, K. (2011) Half-titanocenes for Precise Olefin Polymerisation: Effects of Ligand Substituents and Some Mechanistic Aspects. Dalton Transactions, 40, 7666-7682.

- Nomura, K., Fujita, K. and Fujiki, M. (2004) Effects of Cyclopentadienyl Fragment in Ethylene, 1-Hexene, and Styrene Polymerizations Catalyzed by Half-titanocenes Containing Ketimide Ligand of the Type, $\text{Cp}'\text{TiCl}_2(\text{N}=\text{C}'\text{Bu}_2)$. *Catalysis Communications*, 5(8), 413-417.
- Nomura, K., Fujita, K. and Fujiki, M. (2004) Olefin Polymerization by (Cyclopentadienyl)(Ketimide)Titanium(IV) Complexes of the Type, $\text{Cp}'\text{TiCl}_2(\text{N}=\text{C}'\text{Bu}_2)$ -methylaluminoxane (MAO) Catalyst Systems. *Journal of Molecular Catalysis A: Chemical*, 220(2), 133-144.
- Nomura, K., Fukuda, H., Katao, S., Fujiki, M., Kim, H.-J., Kim, D.-H. and Zhang, S. (2011) Effect of Ligand Substituents in Olefin Polymerisation by Half-sandwich Titanium Complexes Containing Monoanionic Iminoimidazolidide ligands-MAO catalyst systems. *Dalton Transactions*, 44, 7842-7849.
- Nomura, K. and Itagaki, K. (2005) Efficient Incorporation of Vinylcyclohexane in Ethylene/Vinylcyclohexane Copolymerization Catalyzed by Nonbridged Half-Titanocenes. *Macromolecules*, 38(20), 8121-8123.
- Nomura, K., Itagaki, K. and Fujiki, M. (2005) Efficient Incorporation of 2-Methyl-1-pentene in Copolymerization of Ethylene with 2-Methyl-1-pentene Catalyzed by Nonbridged Half-Titanocenes. *Macromolecules*, 38(6), 2053-2055.
- Nomura, K., Kakinuki, K., Fujiki M. and Itagaki, K. (2008) Direct Precise Functional Group Introduction into Polyolefins: Efficient Incorporation of Vinyltrialkylsilanes in Ethylene Copolymerizations by Nonbridged Half-Titanocenes. *Macromolecules*, 41(23), 8974-8976.
- Nomura, K., Kitiyanan, B. (2008) A Review for Synthesis of Polyolefins Containing Polar Functional Groups. *Current Organic Synthesis*, 5, 217.
- Nomura, K., Komatsu, T. and Imanishi, Y. (2000) Polymerization of 1-Hexene, 1-Octene Catalyzed by $\text{Cp}'\text{TiCl}_2(\text{O}-2,6-\text{'Pr}_2\text{C}_6\text{H}_3)$ -MAO System. Unexpected Increase of the Catalytic Activity for Ethylene/1-Hexene Copolymerization by $(1,3-\text{'Bu}_2\text{C}_5\text{H}_3)\text{TiCl}_2(\text{O}-2,6-\text{'Pr}_2\text{C}_6\text{H}_3)$ -MAO catalyst system. *Journal of Molecular Catalysis A: Chemical*, 152, 249-252.

- Nomura, K., Komatsu, T. and Imanishi, Y. (2000) Ligand Effect in Olefin Polymerization Catalyzed by (Cyclopentadienyl)(Aryloxy) Titanium(IV) Complexes, $\text{Cp}'\text{TiCl}_2(\text{OAr})-\text{MAO}$ System.: Ethylene/1-Hexene Copolymerization by $(1,3\text{-}^t\text{Bu}_2\text{C}_5\text{H}_3)\text{TiCl}_2(\text{O-2,6-}^t\text{Pr}_2\text{C}_6\text{H}_3)-\text{MAO}$ Catalyst System. *Journal of Molecular Catalysis A: Chemical*, 159(1), 127-137.
- Nomura, K., Komatsu, T. and Imanishi, Y. (2000) Syndiospecific Styrene Polymerization and Efficient Ethylene/Styrene Copolymerization Catalyzed by (Cyclopentadienyl)(aryloxy)titanium(IV) Complexes-MAO System. *Macromolecules*, 33(22), 8122-8124.
- Nomura, K., Komatsu, T., Nakamura, M. and Imanishi, Y. (2000) Effect of Cocatalyst in 1-Hexene Polymerization by $\text{Cp}'\text{TiMe}_2(\text{O-2,6-}^t\text{Pr}_2\text{C}_6\text{H}_3)$ Complex. *Journal of Molecular Catalysis A: Chemical*, 164, 131-135.
- Nomura, K., Liu, J., Fujiki, M. and Takemoto, A. (2007) Facile, Efficient Functionalization of Polyolefins via Controlled Incorporation of Terminal Olefins by Repeated 1,7-Octadiene Insertion. *Journal of American Chemical Society*, 129(46), 14170-14171.
- Nomura, K., Liu, J., Padmanabhan, S. and Kitayanan, B. (2007) Nonbridged Half-Metallocenes Containing Anionic Ancillary Donor Ligands: New Promising Candidates as Catalysts for Precise Olefin Polymerization. *Journal of Molecular Catalysis A: Chemical*, 267, 1-29.
- Nomura, K., Naga, N., Miki, M. and Yanagi, K. (1998) Olefin Polymerization by (Cyclopentadienyl)(aryloxy)titanium(IV) Complexes-Cocatalyst Systems. *Macromolecules*, 31(22), 7588-7597.
- Nomura, K., Naga, N., Miki, M., Yanagi, K. and Imai, A. (1998) Synthesis of Various Nonbridged Titanium(IV) Cyclopentadienyl-Aryloxy Complexes of the Type $\text{Cp}\text{Ti}(\text{OAr})\text{X}_2$ and Their Use in the Catalysis of Alkene Polymerization. Important Roles of Substituents on both Aryloxy and Cyclopentadienyl Groups. *Organometallics*, 17(11), 2152-2154.
- Nomura, K., Okumura, H., Komatsu, T. and Naga, N. (2002) Ethylene/Styrene Copolymerization by Various (Cyclopentadienyl)(aryloxy)titanium(IV) Complexes-MAO Catalyst Systems. *Macromolecules*, 35(14), 5388-5395.

- Nomura, K., Oya, K., Komatsu, T. and Imanishi, Y. (2000) Effect of the Cyclopentadienyl Fragment on Monomer Reactivities and Monomer Sequence Distributions in Ethylene/ α -Olefin Copolymerization by a Nonbridged (Cyclopentadienyl)(aryloxy)titanium(IV) Complex-MAO Catalyst System. *Macromolecules*, 33(9), 3187-3189.
- Nomura, K., Oya, K. and Imanishi, Y. (2001) Ethylene/ α -Olefin Copolymerization by Various Nonbridged (Cyclopentadienyl)(Aryloxy)Titanium(IV) Complexes-MAO catalyst system. *Journal of Molecular Catalysis A: Chemical*, 174, 127-140.
- Nomura, K., Tsubota, M. and Fujiki, M. (2003) Efficient Ethylene/Norbornene Copolymerization by (Aryloxo)(indenyl)titanium(IV) Complexes-MAO Catalyst System. *Macromolecules*, 36(11), 3797-3799.
- Nomura, K., Wang, W., Fujiki, M. and Liu, J. (2006) Notable Norbornene (NBE) Incorporation in Ethylene-NBE Copolymerization Catalysed by Nonbridged Half-titanocenes: Better Correlation Between NBE Incorporation and Coordination Energy. *Chemical Communications*, 25, 2659-2661.
- Nomura, K., Yamada, J., Wang W. and Liu, J. (2007) Effect of Ketimide Ligand for Ethylene Polymerization and Ethylene/Norbornene Copolymerization Catalyzed by (Cyclopentadienyl)(Ketimide)Titanium Complexes-MAO Catalyst Systems: Structural Analysis for $Cp^*\text{TiCl}_2(N=C\text{Ph}_2)$. *Journal of Organometallic Chemistry*, 692(21), 4675-4682.
- Nomura, K., Zhang, H. and Byun, D.-J. (2008) Factors Affecting Product Distributions in Ethylene/Styrene Copolymerization by (Aryloxo)(Cyclopentadienyl)Titanium Complexes-MAO Catalyst Systems. *Journal of Polymer Science Part A: Polymer Chemistry*, 46(12), 4162-4174.
- Okuda, J., Schattenmann, F. J., Wocadlo, S. and Massa, W. (1995) Synthesis and Characterization of Zirconium Complexes Containing a Linked Amido-Fluorenyl Ligand. *Organometallics*, 14(2), 789-795.
- Panda, T.K., Hrib, C. G., Jones, P. G., Tamm, M. (2010) Synthesis and Characterization of Homoleptic Imidazolin-2-Iminato Rare Earth Metal Complexes. *Journal of Organometallic Chemistry*, 695, 2768-2773.

- Panda, T. K., Randoll, S., Hrib, C. G., Jones, P. G., Bannenberg, T. and Tamm, M. (2007) Syntheses and Structures of Mononuclear Lutetium Imido Complexes with Very Short Lu–N Bonds. Chemical Communications, 5007-5009.
- Panda, T. K., Trambitas, A. G., Bannenberg, T., Hrib, C. G., Randoll, S., Jones, P. G. and Tamm, M. (2009) Imidazolin-2-iminato Complexes of Rare Earth Metals with Very Short Metal–Nitrogen Bonds: Experimental and Theoretical Studies. Inorganic Chemistry, 48(12), 5462-5472.
- PlasticsEurope website, <http://www.plasticseurope.co.uk/>
- Provasoli, A., Ferro, D. R., Tritto I. and Boggioni, L. The Conformational Characteristics of Ethylene–Norbornene Copolymers and Their Influence on the ^{13}C NMR Spectra. (1999) Macromolecules, 32(20), 6697-6706.
- Randall, J. C. (1989) Characterization of Long-Chain Branching in Polyethylenes Using High-Field Carbon-13 NMR. Journal of Macromolecular Science - Reviews in Macromolecular Chemistry & Physics, C29 (2&3), 201-317.
- Reichert, K.H. and Meyer, K.R. (1973) Zur kinetik der niederdruckpolymerisation von äthylen mit löslichen ZIEGLER-katalysatoren . Makromolekulare Chemie, 169(1), 163-176.
- Richter, J., Edelmann, F. T., Noltemeyer, M., Schmidt, H.-G., Schmulinson M. and Eisen, M. S. (1998) Metallocene Analogues Containing Bulky Heteroallylic Ligands and Their Use as New Olefin Polymerization Catalysts. Journal of Molecular Catalysis A: Chemical, 130, 149-162.
- Rodrigues, A.-S. and Carpentier, J.-F. (2008) Groups 3 and 4 Single-site Catalysts for Styrene–Ethylene and Styrene– α -Olefin Copolymerization. Coordination Chemistry Reviews, 252, 2137-2154
- Ruchatz, D. and Fink, G. (1998) Ethene–Norbornene Copolymerization Using Homogenous Metallocene and Half-Sandwich Catalysts: Kinetics and Relationships between Catalyst Structure and Polymer Structure. 1. Kinetics of the Ethene–Norbornene Copolymerization Using the [(Isopropylidene)(η^5 -inden-1-ylidene- η^5 -cyclopentadienyl)]zirconium Dichloride/Methylaluminoxane Catalyst. Macromolecules, 31(15), 4669-4673.

- Ruchatz, D. and Fink, G. (1998) Ethene–Norbornene Copolymerization Using Homogenous Metallocene and Half-Sandwich Catalysts: Kinetics and Relationships between Catalyst Structure and Polymer Structure. 2. Comparative Study of Different Metallocene- and Half-Sandwich/Methylaluminoxane Catalysts and Analysis of the Copolymers by ^{13}C Nuclear Magnetic Resonance Spectroscopy. *Macromolecules*, 31(15), 4674-4680
- Ruchatz, D. and Fink, G. (1998) Ethene–Norbornene Copolymerization with Homogeneous Metallocene and Half-Sandwich Catalysts: Kinetics and Relationships between Catalyst Structure and Polymer Structure. 3. Copolymerization Parameters and Copolymerization Diagrams. *Macromolecules*, 31(15), 4681-4683.
- Ruchatz, D. and Fink, G. (1998) Ethene–Norbornene Copolymerization with Homogeneous Metallocene and Half-Sandwich Catalysts: Kinetics and Relationships between Catalyst Structure and Polymer Structure. 4. Development of Molecular Weights. *Macromolecules*, 31(15), 4684-4686.
- Schellenberg, J., (2009) Recent Transition Metal Catalysts for Syndiotactic Polystyrene. *Progress in Polymer Science*, 34(8), 688-718.
- Sharma, M., Botoshanskii, M., Bannenberg, T., Tamm, M. and Eisen, M. S. (2010) Synthesis and Structure Determination of a Stable Organometallic Uranium(v) Imine Complex and Its Isolobal Anionic U(IV)-ate Complex. *Comptes Rendus Chimie*, 13, 767-774.
- Sernetz, F. and Mülhaupt, R. (1997) Metallocene-Catalyzed Ethene/Styrene Co- and Terpolymerization with Olefinic Termonomers. *Journal of Polymer Science Part A: Polymer Chemistry*, 35(13), 2549-2560.
- Sita, L. R. and Babcock, J. R. (1998) Rapid Access to Dimethylcyclopentadienyltitanium(IV) Amidinate, $(\text{C}_5\text{R}_5)\text{TiMe}_2 [\text{NR}^1\text{C}(\text{R}^2)\text{NR}^3]$ ($\text{R} = \text{H}$ and Me ; $\text{R}^2 = \text{Me}$), Libraries. *Organometallics*, 17(24), 5228-5230.
- Stelzig, S. H., Tamm, M. and Waymouth, R. M. (2008) Copolymerization Behavior of Titanium Imidazolin-2-iminato Complexes. *Journal of Polymer Science Part A: Polymer Chemistry*, 46(18), 6064-6070.

- Soga, K., Lee, D. H. and Yanagihara, H. (1988) Copolymerization of Ethylene with Styrene Using the Catalyst System Composed of Solvay-type $TiCl_3$ and $Cp_2Ti(CH_3)_2$. Polymer Bulletin, 20(3), 237-241.
- Soga, K., Uozumi, T., Nakamura, S., Toneri, T., Teranishi, T., Sano, T., Arai, T. and Shiono, T. (1996) Structures of Polyethylene and Copolymers of Ethylene with 1-Octene and Oligoethylene Produced with the Cp_2ZrCl_2 and $[(C_5Me_4)SiMe_2N(t-Bu)]TiCl_2$ Catalysts. Macromolecular Chemistry and Physics, 197(12), 4237-4251.
- Son, K.-S., Joege, F. and Waymouth, R. M. (2008) Copolymerization of Styrene and Ethylene at High Temperature with Titanocenes Containing a Pendant Amine Donor. Macromolecules, 41(24), 9663-9668.
- Stephan, D. W. (2005) The Road to Early-Transition-Metal Phosphinimide Olefin Polymerization Catalysts. Organometallics, 24(11), 2548-2560.
- Stephan, D. W., Stewart, J. C., Brown, S. J., Swabey, J. W. and Wang, Q. (1998) EP881233 A1.
- Stephan, D. W., Stewart, J. C., Guérin, F., Courtenay, S., Kickham, J., Hollink, E., Beddie, C., Hoskin, A., Graham, T., Wei, P., Spence, R. E. v. H.; Xu, W., Koch, L., Gao, X. and Harrison, D. G. (2003) An Approach to Catalyst Design: Cyclopentadienyl-Titanium Phosphinimide Complexes in Ethylene Polymerization. Organometallics, 22(9), 1937-1947.
- Stephan, D. W., Stewart, J. C., Guérin, F., Spence, R. E. v. H., Xu, W. and Harrison, D. G. (1999) Phosphinimides as a Steric Equivalent to Cyclopentadienyl: An Approach to Ethylene Polymerization Catalyst Design. Organometallics, 18(7), 1116-1118.
- Suhm, J., Heinemann, J., Wörner, C., Müller, P., Stricker, F., Kressler, J., Okuda, J. and Mühlaupt, R. (1998) Novel Polyolefin Materials via Catalysis and Reactive Processing. Macromolecular Symposia, 129, 1-28.
- Suhm, J. and Kaminsky, W. (1996) New Polymers by Metallocene Catalysis. Macromolecular Chemistry and Physics, 197(12), 3907-3945.
- Suhm, J., Schneider, M. J. and Mühlaupt, R. (1997) Temperature Dependence of Copolymerization Parameters in Ethene/1-Octene Copolymerization Using

- Homogeneous *rac*-Me₂Si(2-MeBenz[e]Ind)₂ZrCl₂/MAO Catalyst. Journal of Polymer Science Part A: Polymer Chemistry, 35(4), 735-740.
- Suhm, J., Schneider, M. J. and Mülhaupt, R. (1998) Influence of Metallocene Structures on Ethene Copolymerization with 1-Butene and 1-Octene. Journal of Molecular Catalysis A: Chemical, 128, 215-227.
- Tamm, M., Beer, S. and Herdtweck, E. Z. (2004) Trioxorhenium(VII) Complexes with Imidazolin-2-iminato Ligands. Naturforsch, 59b, 1497-1504.
- Tamm, M., Randoll, S., Bannenberg, T. and Herdtweck, E. (2004) Titanium Complexes with Imidazolin-2-iminato Ligands. Chemical Communications, 7, 876-877.
- Tamm, M., Randoll, S., Herdtweck, E., Kleigrewe, N., Kehr, G., Erker, G. and Rieger, B. (2006) Imidazolin-2-iminato Titanium Complexes: Synthesis, Structure and Use in Ethylene Polymerization Catalysis. Dalton Transactions, 459-467.
- Thorshaug, K., Mendichi, R., Boggioni, L., Tritto, I., Trinkle, S., Friedrich, C. and Mülhaupt, R. (2002) Poly(ethene-*co*-norbornene) Obtained with a Constrained Geometry Catalyst. A Study of Reaction Kinetics and Copolymer Properties. Macromolecules, 35(8), 2903-2911.
- Trambitas, A. G., Panda, T. K., Bannenberg, T., Hrib, C. G., Daniliuc, C. G., Jones, P. G., Jenter, J., Roesky, P. W. and Tamm, M. (2010) Rare-Earth Metal Alkyl, Amido, and Cyclopentadienyl Complexes Supported by Imidazolin-2-iminato Ligands: Synthesis, Structural Characterization, and Catalytic Application. Inorganic Chemistry, 49(5), 2435-2446.
- Trambitas, A. G., Yang, J., Melcher, D., Daniliuc, C. G., Jones, P. G., Xie, Z. and Tamm, M. (2011) Synthesis and Structure of Rare-Earth-Metal Dicarbollide Complexes with an Imidazolin-2-iminato Ligand Featuring Very Short Metal–Nitrogen Bonds. Organometallics, 30(5), 1122-1129.
- Tritto, I., Boggioni, L., Jansen, J. C., Thorshaug, K., Sacchi, M. C. and Ferro, D. R. (2002) Ethylene–Norbornene Copolymers from Metallocene-Based Catalysts: Microstructure at Tetrad Level and Reactivity Ratios. Macromolecules, 35(3), 616-623.

- Tritto, I., Boggioni, L., and Ferro, D. R. (2006) Metallocene Catalyzed Ethene- and Propene Co-norbornene Polymerization: Mechanisms from a Detailed Microstructural Analysis. *Coordination Chemistry Review*, 250, 212-241.
- Tritto, I., Marestin, C., Boggioni, L., Sacchi, M. C., Brintzinger, H.-H. and Ferro, D. R. (2001) Stereoregular and Stereoirregular Alternating Ethylene–Norbornene Copolymers. *Macromolecules*, 34(17), 5770-5777.
- Tritto, I., Marestin, C., Boggioni, L., Zetta, L., Provasoli, A., and Ferro, D. R. (2000) Ethylene–Norbornene Copolymer Microstructure. Assessment and Advances Based on Assignments of ^{13}C NMR Spectra. *Macromolecules*, 33(24), 8931-8944.
- Tullo, A. H. (2008) Growing Plastics. *Chemical and Engineering News*, 86(39), 21-25.
- Uozumi, T., Tian, G., Ahn, C. -H., Jin, J., Tsubaki, S., Sano, T. and Soga, K. (2000) Synthesis of Functionalized Alternating Olefin Copolymer and Modification to Graft Copolymer by Hydrosilylation. *Journal of Polymer Science Part. A: Polymer Chemistry*, 38(10), 1844–1847.
- Wang, W., Fujiki, M. and Nomura, K. (2005) Copolymerization of Ethylene with Cyclohexene (CHE) Catalyzed by *Nonbridged* Half-Titanocenes Containing Aryloxo Ligand: Notable Effect of Both Cyclopentadienyl and Anionic Donor Ligand for Efficient CHE Incorporation. *Journal of American Chemical Society*, 127(12), 4582-4583.
- Wang, W., Tanaka, T., Tsubota, M., Fujiki, M., Yamanaka, S. and Nomura, K. (2005) Effect of Cyclopentadienyl Fragment in Copolymerization of Ethylene with Cyclic Olefins Catalyzed by *Non-Bridged* (Aryloxo) (cyclopentadienyl)titanium(IV) Complexes. *Advance Synthesis and Catalysis*, 347, 433-446.
- Yoshida, Y., Mohri, J., Ishii, S., Mitani, M., Saito, J., Matsui, S., Makio, H., Nakano, T., Tanaka, H., Onda, M., Yamamoto, Y., Mizuno, A. and Fujita, T. (2004) Living Copolymerization of Ethylene with Norbornene Catalyzed by Bis(Pyrrolide–Imine) Titanium Complexes with MAO. *Journal of America Chemical Society*, 126(38), 12023-12302.

- Yoshida, Y., Saito, J., Mitani, M., Takagi, Y., Matsui, S., Ishii, S., Nakano, T., Kashiwa, N. and Fujita, T. (2002) Living Ethylene/Norbornene Copolymerisation Catalyzed by Titanium Complexes having Two Pyrrolide-imine Chelate Ligands. *Chemical Communications*, 12, 1298.
- Zhang, H., Byun, D.-J. and Nomura, K. (2007) Tuning the Active Species from Syndiospecific Styrene Polymerisation to Ethylene/Styrene Copolymerisation by (Aryloxo)(Cyclopentadienyl)Titanium Complexes-MAO Catalysts. *Dalton Transactions*, 18, 1802-1806.
- Zhang, H. and Nomura, K. (2005) Living Copolymerization of Ethylene with Styrene Catalyzed by (Cyclopentadienyl)(ketimide)titanium(IV) Complex-MAO Catalyst System. *Journal of America Chemical Society*, 127(26), 9364-9365.
- Zhang, H. and Nomura, K. (2006) Living Copolymerization of Ethylene with Styrene Catalyzed by (Cyclopentadienyl)(ketimide)titanium(IV) Complex-MAO Catalyst System: Effect of Anionic Ancillary Donor Ligand. *Macromolecules*, 39(16), 5266-5274.
- Zhang, S., and Piers, W. E.; (2001) Synthesis of Complexes and Reaction Chemistry with Borates. *Organometallics*, 20, 2088-2092.
- Zhang, S., Piers, W. E., Gao, X. and Parvez, M. (2000) The Mechanism of Methane Elimination in $B(C_6F_5)_3$ -Initiated Monocyclopentadienyl-Ketimide Titanium and Related Olefin Polymerization Catalysts. *Journal of American Chemical Society*, 122(23), 5499-5509.
- Zhang, S., Tamm, M. and Nomura, K. (2011) 1,2-C-H Activation of Benzene Promoted by (Arylimido)vanadium(V)-Alkylidene Complexes: Isolation of the Alkylidene, Benzyne Complexes. *Organometallics*, 30(10), 2712-2720.

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2. Apisuk, W.; Trambitas, A. G.; Kitiyanan, B.; Tamm, M.; and Nomura, K. (2013). Efficient Ethylene/Norbornene Copolymerization by Half-Titanocenes Containing Imidazolin-2-iminato Ligands - MAO Catalyst Systems. (Accepted in Journal of Polymer Science Part A: Polymer Chemistry, 2013, February 12)
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4. Apisuk, W.; Kitiyanan, B.; Kim, H. J.; Kim, D. H.; and Nomura, K. (2013). Introduction of Reactive Functionality by Incorporation of Divinylbiphenyl in Ethylene Copolymerization with Styrene or 1-Hexene Using by Aryloxo-Modified Half-Titanocenes - MAO Catalysts. (Accepted in Journal of Polymer Science Part A: Polymer Chemistry, 2013, February 14)

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4. Nomura, K.; Fukuda, H.; Apisuk, W.; Trambitas, A. G.; Kitiyanan, B.; and Tamm, M. (2011, December 10). Ethylene (Co)polymerization by Half-titanocenes Containing 1,3-Imidazolin-2-iminato Ligands. Poster presented at International Symposium on Nano Science and Functional Materials Post-symposium of International Symposium on Catalysis and Fine Chemicals 2011, Tokyo, Japan.