

## *Curriculum Vitae*

### **Prof. Avthandil A. Koridze**

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**Date and place of birth:** September 14, 1939; Batumi, Georgia

#### **EDUCATION**

- 1957 – 1962** Undergraduate Student, I.M.Gubkin Moscow Institute of Petrochemical and Gas Industry
- 1965 – 1968** Post Graduate Student, I.M. Gubkin Moscow Institute of Petrochemical and Gas Industry

#### **SCIENTIFIC DEGREES AND TITLES**

- 1969** Ph.D., Chemistry, I.M. Gubkin Moscow Institute of Petrochemical and Gas Industry. Thesis Research: “Synthesis of Some Nitrogen-Containing Ferrocene Derivatives and Polymers Thereof .“
- 1988** Dr.Sci., Chemistry, A.N. Nesmeyanov Institute of Organo-Element Compounds, Russian Academy of Sciences, Moscow. Thesis Research: “A Problem of Stabilization of Organometallic Carbocations, and Application of Magnetic Isotopes Iron-57 and Osmium-187 in Organometallic Chemistry“.
- 1991** Professor (Specialization “Chemistry of Organo-Element Compounds”, certificate of diploma #019024, Moscow)

#### **CAREER/EMPLOYMENT**

- 2013** – **Present:** Associate Professor of Chemistry, Tbilisi State University, Department of Exact and Natural Sciences
- 2009** – **Present:** Director of the Institute of Organometallic Chemistry, Tbilisi State University

- 1993 – 2013:** Head of Laboratory of Organometallic Cluster Chemistry, A.N. Nesmeyanov Institute of Organo-Element Compounds, Moscow
- 1989 – 1993:** Leading Research Scientist, Laboratory of Organometallic Cluster Chemistry, A.N. Nesmeyanov Institute of Organo-Element Compounds, Moscow
- 1977 – 1989:** Senior Research Scientist, Laboratory of Organometallic Chemistry, A.N. Nesmeyanov Institute of Organo - Element Compounds, Moscow
- 1971 – 1977:** Junior Research Scientist, Laboratory of Organometallic Chemistry, A.N. Nesmeyanov Institute of Organo - Element Compounds, Moscow

### **PROFESSIONAL ASSOCIATIONS**

Member of the American Chemical Society, Inorganic Division, Organometallic Subdivision

### **RESEARCH INTERESTS**

Organometallic synthesis, transition metal clusters, organometallic carbocations, metallocene-based pincer complexes, alkane functionalization, activation of small molecules, hydrogen production, homogeneous catalysis.

### **SCIENTIFIC ACHIEVEMENTS**

A mode of intramolecular scrambling of CO groups in binary trinuclear osmium and ruthenium carbonyl clusters has been established.

NMR spectroscopy of iron-57 and osmium-187 nuclei has been applied for the first time for studying the structures and stereodynamic behavior of iron and osmium organometallic complexes, including studies of the structure and stabilization mechanism of ferrocenylcarbocations and related cationic complexes.

Fluxionality of bridging acetylide ligands in cluster complexes has been discovered.

In the course of studies of reactions of manganese, rhenium and iron acetylide complexes with triosmium clusters, the transfer of the acetylide ligand to a cluster, novel reactions of formation and cleavage of carbon-carbon and carbon-heteroatom bonds under extremely mild conditions have been found; complexes with bridging vinylidene and carbyne ligands have been obtained and their interconversion was demonstrated.

A new linear dimerization of internal silylalkynes and their co-dimerization with other alkynes on triruthenium and triosmium clusters have been discovered that includes alkyne – vinylidene coupling with formation of intermediate metallacyclobutene complexes and double activation of methyl C-H bonds.

Novel types of digold-tetrarhenium, tetraruthenium, and ruthenium-triosmium clusters with ferrocenylacetylide ligands have been synthesized.

For the first time metallocene – based pincer complexes of platinum group metals have been obtained, that are promising catalysts for transformations of organic substrates.

Iridium hydrido complexes with bis(phosphine) pincer ligands based on ferrocene and ruthenocene are the most active among all known homogeneous catalysts for alkane dehydrogenation.

During the study of hydrogen activation with cationic ruthenium pincer complexes based on ferrocene and ruthenocene, two absolutely new types of complexes were found: ruthenium atom stabilized metallocenium ions which could be considered as models of elusive intermediates in electrophilic aromatic substitution in metallocene system, and cationic ruthenium metallocenylidene complexes – analogs of metallocenylcarbocations.

Catalytic dehydrogenation of alcohols by iridium pincer complexes has been studied. Acceptorless dehydrogenation of secondary alcohols proceeds with high TONs. Primary alcohols readily decarbonylated even at room temperature to give Ir-CO carbonyl adducts. The mechanism of this transformation was studied in detail, especially for EtOH; new intermediates were isolated and characterized.

## RESEARCH GRANTS

- 2001 – 2004 Proton-transfer reactions orchestrated by transition metal hydrides (INTAS)
- 2005 – 2007 New generation pincer complexes: Synthesis and application in catalysis of metallocene-based pincer complexes of platinum metals (CRDF)
- 2006 – 2009 Alkane selective functionalization. Synthesis of metallocene-based pincer complexes of a new generation, catalysts for alkane dehydrogenation (ISTC)
- 2007 – 2010 Hetero-multimetallic catalysts for the asymmetric formation of C-C bonds (ISTC)
- 2008 – 2010 Activation of ammonia and amines by iridium and rhodium bis(phosphine) pincer complexes based on the metallocenes. Creation of catalysts for hydroamination of alkenes (Russ. Found. for Bas. Res.)
- 2009 – 2012 Electronic communication between ferrocene centers in bis(ferrocenylalkynyl) derivatives of heterometallic gold-rhenium cluster (GNSF)
- 2011 – 2012 Organometallic chemistry and application in catalysis of multidentate *N*-heterocyclic carbenes (Russ. Found. for Bas. Res.)
- 2011 – 2013 From the first metallocenium ions – to the first metallocenylidene complexes. Cationic pincer complexes of ruthenium and osmium with metallocene core: Activation of small molecules and unusual rearrangements (Russ. Found. for Bas. Res.)

## TEACHING (only Tbilisi State University Listed)

2013 – 2017 Professor A.A. Koridze teaching graduate and under graduate chemistry courses in Organometallic Chemistry

Under guidance of Prof. A.A. Koridze 10 candidate dissertations have been prepared.

## SERVICE

*Organometallics*, journal referee

*Russian Chemical Bulletin*, journal referee

*Russian Foundation for Basic Research*, proposal referee

*Journal of the American Chemical Society*, journal referee

*Chemical Reviews*, journal referee

Prof. A.A. Koridze is the author of more than 130 publications in peer reviewed journals.

## SELECTED PUBLICATIONS

A.V. Polukeev, P.V. Petrovskii, A.S. Peregudov, M.G. Ezernitskaya, **A.A. Koridze**. Dehydrogenation of alcohols by bis(phosphinite) benzene based and bis(phosphine) ruthenocene based iridium pincer complexes. *Organometallics*, **2013**, *32* (4), 1000-1015.

D.M. Panov, P.V. Petrovskii, M.G. Ezernitskaya, A.F. Smol'yakov, F.M. Dolgushin, **A.A. Koridze**. Rhodium and iridium complexes of a new ferrocene-derived chelating bis(NHC) ligand. *Dalton Trans.*, **2012**, *41* (32), 9667-9671.

R.V. Chedia, F.M. Dolgushin, A.F. Smol'yakov, O.I. Lekashvili, Ts.V. Kakulia, L.K.J. Aniaashvili, **A.A. Koridze**. Cleavage of ferrocenylbutadiynyl on a rhenium-gold cluster: Synthesis and molecular structure of  $\text{Re}_4(\text{AuPPh}_3)(\mu_4\text{-C}_2)(\mu_3\text{-C}_2\text{Fc})(\text{NCMe})(\text{CO})_{13}$ . *Inorg. Chim. Acta*, **2011**, *378* (1), 264-268.

A.V. Polukeev, S.A. Kuklin, P.V. Petrovskii, S.M. Peregudova, A.F. Smol'yakov, F.M. Dolgushin, **A.A. Koridze**. Synthesis and characterization of fluorophenylpalladium pincer complexes: Electronic properties of some pincer ligands evaluated by multinuclear NMR spectroscopy and electrochemical studies. *Dalton Trans.*, **2011**, *40* (27), 7201-7209.

D.M. Panov, A.V. Polezhaev, A.V. Polukeev, P.V. Petrovskii, **A.A.K oridze**. Alkylation of nitrogen heterocycles with 1,3 – bis(hydroxymethyl)ferrocene. Generation of ferrocene dicarbocation  $[\{1,3-(CH_2)_2C_5H_3\}Fe(C_5H_5)]^{2+}$ . *Russ.Chem.Bull., Int.Ed.*, **2010**, *59*(11), 2098-2101.

**A.A. Koridze**, A.V. Polezhaev, S.V. Safronov, A.M. Sheloumov, F.M. Dolgushin, M.G. Ezernitskaya, B.V.Lokshin, P.V.Petrovskii, A.S.Peregudov. Cationic ruthenium hydrido-carbonyls derived from metallocene-based pincers: Unusual rearrangements and H<sub>2</sub> evolution with formation of cationic ruthenium metallocenylienes. *Organometallics*, **2010**, *29*(19), 4360-4368.

A.V .Polukeev, S.A. Kuklin, P.V. Petrovskii, A.S. Peregudov, F.M. Dolgushin, M.G.Ezernitskaya, **A.A.Koridze**. Reactions of iridium bis(phosphinite) pincer complexes with protic acids. *Russ. Chem.Bull., Int.Ed.*, **2010**, *59*(4), 745-749.

A.V. Polezhaev, S.A. Kuklin, D.M. Ivanov, P.V. Petrovskii, F.M. Dolgushin, M.G. Ezernitskaya, **A.A. Koridze**. Activation of small molecules by a rhodium bis(phosphinite) pincer complex. *Russ. Chem. Bull., Int.Ed.*, **2009**, *58*(9), 1847-1854.

**A.A. Koridze**, A.M. Sheloumov, F.M. Dolgushin, M.G. Ezernitskaya, E. Rosenberg, A .Sharmin, M. Ravera. Bis(ferrocenylethynyl)-substituted digold-tetrahiridium cluster: Unusual structure and electronic communication between ferrocenyl groups. *Organometallics*, **2008**, *27*(23), 6163-6169.

A.M. Sheloumov, P. Tundo, F.M. Dolgushin, **A.A.K oridze**. Suzuki aryl coupling catalysed by palladium bis(phosphane) pincer complexes based on ferrocene. X-ray structure determination of  $\{PdCl[\{2,5-(tBu_2PCH_2)_2C_5H_2\}Fe(C_5H_5)]\}OTf$ . *Eur.J.Inorg.Chem.*, **2008**, (4), 572-576.

S.A .Kuklin, T.M. Sheloumov, F.M. Dolgushin, M.G. Ezernitskaya, A.S.P eregudov, P.V. Petrovskii, **A.A.Koridze**. Highly active iridium catalysts for alkane dehydrogenation. Synthesis and properties of iridium bis(phosphine) pincer complexes based on ferrocene and ruthenocene. *Organometallics*, **2006**, *25*(22), 5466-5476.

**A.A. Koridze**, S.A. Kuklin, A.M. Sheloumov, F.M. Dolgushin, V.Yu. Lagunova, P.V. Petrovskii, E.V. Vorontsov, M. Baya, R. Poli. Ferrocene-based pincer complexes of palladium: Synthesis, structures, and spectroscopic and electrochemical properties. *Organometallics*, **2004**, *23*(20), 4585-4593.

**A.A.K oridze**, S.A. Kuklin, A.M .Sheloumov, M.V. Kondrashov, F.M. Dolgushin, M.G. Ezernitskaya, P.V. Petrovskii, E.V. Vorontsov. Palladium pincer complexes  $Pd(BH_4)[\{2,5-(R_2PCH_2)_2C_5H_2\}Fe(C_5H_5)]$  (R=Pr<sup>i</sup>, Bu<sup>t</sup>) with unidentate borohydride ligand. *Russ.Chem.Bull., Int.Ed.*, **2003**, *52*(12), 2757-2759.

**A.A. Koridze**, A.M. Sheloumov, S.A. Kuklin, V.Yu. Lagunova, I.I. Petukhova, F.M.Dolgushin, M.G .Ezernitskaya, P.V. Petrovskii, A.A. Macharashvili, R.V. Chedia. P,C,P pincer complexes based on the metallocenes. Crystal structure of the rhodium complex *cis*-RhCl<sub>2</sub>(CO)[{2,5-(Pr<sup>i</sup><sub>2</sub>PCH<sub>2</sub>)<sub>2</sub>C<sub>5</sub>H<sub>2</sub>}Fe(C<sub>5</sub>H<sub>5</sub>)]. *Russ.Chem.Bull., Int.Ed.*, **2002**, *51*(6), 1077-1078.

**A.A.Koridze.** Reactions of ruthenium and osmium cluster carbonyls with heteroatom substituted and functionalized alkynes. *Russ.Chem.Bull., Int.Ed.*, **2000**, *49* (1), 1-18.

**A.A.Koridze**, A.M.Sheloumov, F.M.Dolgushin, A.I.Yanovsky, Yu.T.Struchkov, P.V.Petrovskii. Synthesis and structure of heteronuclear alkyne cluster  $\text{RuOs}_3(\mu_4\text{-HC}_2\text{Me})(\text{CO})_{12}$ . *J.Organomet.Chem.*, **1997**, *536-537*, 381-384.

**A.A.Koridze**, V.I.Zdanovich, A.M.Sheloumov, V.Yu.Lagunova, P.V.Petrovskii, A.S.Peregudov, F.M.Dolgushin, A.I.Yanovsky. Synthesis of the tetranuclear clusters  $\text{RuM}_3\text{H}(\text{C}_2\text{Fc})(\text{CO})_{12}$  (M=Ru, Os; Fc=ferrocenyl), containing a fluxional  $\mu_4$  – acetylide ligand. Structure of a mixed crystal containing tetranuclear ( $\text{Ru}_4\text{H}(\text{C}_2\text{Fc})(\text{CO})_{12}$ ) and trinuclear ( $\text{Ru}_3\text{H}(\text{C}_2\text{Fc})(\text{CO})_9$ ) ruthenium clusters. *Organometallics*, **1997**, *16* (11), 2285-2290.

**A.A.Koridze**, V.I.Zdanovich, N.V.Andrievskaya, Yu.Siromakhova, P.V.Petrovskii, M.G.Ezernitskaya, F.M.Dolgushin, A.I.Yanovsky, Yu.T.Struchkov. Reactions of 1,4 – diferrocenyl – 1,3 – diyne and 1,4 – diphenylbut–1-en–3-yne with  $\text{Ru}_3(\text{CO})_{12}$ . Crystal structure of  $\text{Ru}_3(\text{CO})_8\{\mu_3\text{-}\eta^1\text{-}\eta^1\text{-}\eta^4\text{-}\eta^2\text{-C}_4\text{Ph}_2(\text{CH}=\text{CHPh})_2\}$ . *Russ.Chem.Bull., Int.Ed.*, **1996**, *45* (5), 1200 -1206.

**A.A.Koridze**, N.M.Astakhova, F.M.Dolgushin, A.I.Yanovsky, Yu.T.Struchkov, P.V.Petrovskii. A triosmium cluster with a novel mode of metallacyclopentadiene fragment bonding. X-ray crystal structure and reactivity of  $\text{Os}_3\{\mu_3\text{-}\eta^1\text{:}\eta^1\text{:}\eta^2\text{:}\eta^2\text{-C}(\text{SiMe}_3)\text{C}(\text{Me})\text{C}(\text{H})\text{C}(\text{Ph})\}(\text{CO})_9$ . *Organometallics*, **1995**, *14* (5), 2167-2169.

**A.A.Koridze**, N.M.Astakhova, P.V.Petrovskii, F.M.Dolgushin, Yu.T.Struchkov. Dimerization of trimethylsilylpropyne on a triosmium cluster. Formation, crystal structure and rearrangement of  $\text{Os}_3\text{H}[\mu_3\text{-C}(\text{SiMe}_3)\text{C}(\text{Me})\text{C}(\text{SiMe}_3)\text{CH}_2](\text{CO})_9$  complex. *J.Organomet.Chem.*, **1994**, *481*(2), 247-252.

**A.A.Koridze**, V.I.Zdanovich, O.A.Kizas, A.I.Yanovsky, Yu.T.Struchkov. Coupling and annelation of two acetylide groups and alkyne molecules in the reaction of  $(\text{OC})_5\text{ReC}_2\text{Ph}$  with ferrocenylacetylene. Crystal and molecular structure of  $\text{Re}_2(\text{CO})_7\{\text{C}_8\text{H}_2\text{Ph}_2(\text{C}_5\text{H}_4\text{FeC}_5\text{H}_5)_2\}$ . acetone. *J.Organomet.Chem.*, **1994**, *464* (2), 197-201.

**A.A.Koridze**, A.I.Yanovsky, Yu.T.Struchkov. Reaction of  $\text{Ru}_3(\text{CO})_{12}$  with ferrocenylacetylene. X-ray crystal structure of  $\text{Ru}_2(\text{CO})_6[\text{C}_4\text{H}_2(\text{C}_5\text{H}_4\text{FeC}_5\text{H}_5)_2]$ . *J.Organomet.Chem.*, **1992**, *441*(2), 277-284.

**A.A.Koridze**, V.I.Zdanovich, A.S.Batsanov, Yu.T.Struchkov. Annelation of phenylacetylide groups by thermolysis of  $(\text{OC})_5\text{ReC}_2\text{Ph}$ . X-ray crystal structure of  $\text{Re}_2(\text{CO})_7(\text{C}_2\text{Ph})_4$ . *Mendeleev Commun.*, **1991**, (4), 126-127.

**A.A.Koridze**, O.A.Kizas, P.V.Petrovskii, N.E.Kolobova, Yu.T.Struchkov, A.I.Yanovsky. Intramolecular rearrangement of the bridging  $\sigma,\pi$ -acetylide ligand in the  $\text{Os}_3\text{H}(\text{CO})_9(\text{L})(\mu\text{-}\eta^2\text{-C}_2\text{Ph})$

(L=CO, PMe<sub>2</sub>Ph) clusters and crystal structure of Os<sub>3</sub>H(CO)<sub>9</sub>(PMe<sub>2</sub>Ph)(μ-η<sup>2</sup>-C<sub>2</sub>Ph). *J.Organomet.Chem.*, **1988**, 338(1), 81-87.

**A.A.Koridze**. Ferrocenyl carbocations and related cationic complexes. Structure and stabilization mechanism. *Russ.Chem.Rev.*, **1986**, 55 (2), 113-126.

**A.A.Koridze**, O.A.Kizas, N.E.Kolobova, P.V.Petrovskii. Intramolecular rearrangement of σ,π – acetylide ligand in the complex Os<sub>3</sub>H(CO)<sub>10</sub>(C<sub>2</sub>Ph). *Russ.Chem.Bull.*, **1984**, 33 (2), 437.

**A.A.Koridze**, O.A.Kizas, N.E.Kolobova, V.N.Vinogradova, N.A.Ustynyuk, P.V.Petrovskii, A.I.Yanovsky, Yu.T.Struchkov. Carbon – carbon bond formation by alkyne – μ- η<sup>2</sup> – acetylide and alkyne – CO coupling in the reaction of (OC)<sub>5</sub>MC<sub>2</sub>Ph (M=Mn,Re) with HOs<sub>3</sub>(CO)<sub>10</sub>(μ- η<sup>2</sup>-C<sub>2</sub>Ph). X-ray structure of HOs<sub>3</sub>Re(CO)<sub>10</sub>(C<sub>2</sub>Ph)<sub>2</sub>. *J. Chem. Soc., Chem. Commun.*, **1984**, (17), 1158-1159.

**A.A.Koridze**, N.M.Astakhova, P.V.Petrovskii. <sup>57</sup>Fe NMR chemical shifts and <sup>57</sup>Fe,<sup>13</sup>C coupling constants in α – ferrocenylcarbocations. Direct metal participation in the stabilization of metallocenyl carbocations. *J.Organomet.Chem.*, **1983**, 254(3), 345-360.

**A.A.Koridze**, O.A.Kizas, N.M.Astakhova, P.V.Petrovskii, Yu.K.Grishin. Internuclear exchange of carbonyl groups in Os<sub>3</sub>(CO)<sub>12</sub>: Coupling constants  $J(^{187}\text{Os} - ^{13}\text{C})$  in trinuclear osmium carbonyls. *J. Chem. Soc., Chem. Commun.*, **1981**, (16), 853-855.

N.A.Ogorodnikova, **A.A.Koridze**, S.P.Gubin. Electronic effect of the cyclopentadienyl anion as a substituent. The effect of the alkali metal cation, solvent and complexing agents on <sup>19</sup>F chemical shifts of *m*- and *p*- fluorophenylcyclopentadienyl anions. *J.Organomet.Chem.*, **1981**, 215 (3), 293-301.

**A.A. Koridze**, I.T.Chizhevsky, P.V.Petrovskii, E.I.Fedin, N.E.Kolobova, L.E.Vinogradova, L.A.Leites, V.G.Andrianov, Yu.T.Struchkov. Norbornadiene complexes of transition metals. III. Stereospecificity in the generation of cationic complexes [Rh(2,3,8:5,6,-η-C<sub>7</sub>H<sub>7</sub>CHR)(η-C<sub>5</sub>H<sub>5</sub>)]<sup>+</sup> (R=Me,Ph,ferrocenyl), and molecular structure of [Rh(2,3,8:5,6,-η-C<sub>7</sub>H<sub>7</sub>CH<sub>2</sub>)(η-C<sub>5</sub>H<sub>5</sub>)]<sup>+</sup>PF<sub>6</sub><sup>-</sup>. *J.Organomet.Chem.*, **1981**, 206 (3), 373-391.

**A.A.Koridze**, N.A.Ogorodnikova, P.V.Petrovskii. Stereochemical approach to the problem of bonding in TlC<sub>5</sub>H<sub>5</sub>. <sup>13</sup>C NMR study of diastereotopy of cyclopentadienyl carbon atoms in the C<sub>5</sub>H<sub>4</sub>\*CH(Me)Ph ligand. *J.Organomet.Chem.*, **1978**, 157 (2), 145-151.

**A.A.Koridze**, P.V.Petrovskii, A.I.Mokhov, A.I.Lutsenko, Electronic effects in the cyclopentadienyl ring. <sup>13</sup>C NMR spectra of monosubstituted ferrocenes. *J.Organomet.Chem.*, **1977**, 136 (1), 57-63.

**A.A.Koridze**, S.P.Gubin, N.A.Ogorodnikova. Bond ionicity in TlC<sub>5</sub>H<sub>5</sub>. *J.Organomet.Chem.*, **1974**, 74(2), C37-C39.

**A.A.Koridze**. *Cis*- and *trans*-β-ferrocenyl-β-chloroacrylonitriles. *Russ.Chem.Bull.*, **1971**, 20 (11), 2493.

A.A.Koridze, S.P.Gubin. *Cis-* and *trans-β*-substituted  $\alpha$ -vinylferrocenes. Configuration of trisubstituted ethylenes. *J.Organomet.Chem.*, **1970**, 22 (1),157-169.

## BOOK CHAPTERS

A.A.Koridze. "Organoruthenium Compounds". In: *Metody Elementoorg. Khim.; Kobal't, Nikel', Platinovye Met.*, Eds.A.N.Nesmeyanov and K.A.Kocheshkov, Izd."Nauka", Moscow, 1978, pp.246-314.

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A.A.Koridze. "Osmium - 187 in the Nuclear Magnetic Resonance Spectroscopy". In: *Stable Isotope Osmium - 187 in Scientific Investigations*. Izd. "Nauka" Kaz. SSR, Alma-Ata, 1984, pp.73-78.

A.A.Koridze. "Reactions of Silylalkynes with Triosmium and Triruthenium Clusters", In: *The Synergy between Dynamics and Reactivity at Clusters and Surfaces*. Ed. L.J.Farrugia. NATO ASI Series, Kluwer Academic Publishers, Dordrecht/Boston/London, 1995, pp.351-360.

## PATENTS

A.Koridze. "Alkane and alkane group dehydrogenation with organometallic catalysts". U.S. Patent No.: US 6,909,009, Jun. 21, 2005.

## ABSTRACTS

L.I.Denisovich, A.A.Koridze. "Electrochemical investigation of  $\beta$ - metallocenylacrylonitriles". Ninth Intern.Conf. Organomet. Chem., Dijon, France,1979.

A.A.Koridze, N.M.Astakhova, P.V.Petrovskii. "<sup>57</sup>Fe NMR chemical shifts in ferrocenyl carbonium ions". 4-th FECHEM Conf. Organomet. Chem., Liblice, Czechoslovakia,1982.

A.A.Koridze, O.A.Kizas, N.E.Kolobova. "Carbon - metal bond activation and reversible carbon-carbon bond formation on the face of osmium clusters". XII Intern. Conf. Organomet. Chem.,Vienna, Austria, 1985.

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A.M.Sheloumov, F.M.Dolgushin, A.I.Yanovsky, P.V.Petrovskii, A.A.Koridze. "Formation of triosmium clusters containing osmacyclopentadiene and osmacyclobutene moiety". Intern. School Organomet. Chem., Camerino, Italy, 1997.

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