

Curriculum vitae Prof. Fabio Ragaini

Fabio Ragaini è nato a Milano il 30/7/1962 e ha conseguito la laurea in Chimica con votazione 13/3/87 Laurea in Chimica (110 lode). Gli obblighi militari sono stati espletati tramite Servizio Civile all'interno degli anni di corso senza che questo abbia comportato il finire fuori corso.

1/9/1987 -31/8/1988 borsa di studio dell'Istituto G. Donegani

Novembre 1988-Ottobre 1991 dottorato di ricerca in Scienze Chimiche presso Dipartimento di Chimica Inorganica e Metallorganica dell'Università degli Studi di Milano (relatore prof. S.Cenini).

3/4/1992-31/10/1998 Ricercatore Universitario presso la Facoltà di Scienze MM.FF.NN. dell'Università degli Studi di Milano

22/3/1993-22/12/1993 Visiting scientist al The Pennsylvania State University, presso il gruppo del prof. G. L. Geoffroy.

1/11/98-28/2/2008 Professore Associato (Chimica Generale e Inorganica) presso l'Università degli Studi di Milano.

Dall' 1/3/2008 Professore Straordinario (Chimica Generale e Inorganica) presso l'Università degli Studi di Milano.

Dall' 1/3/2011 Professore Ordinario (Chimica Generale e Inorganica) presso l'Università degli Studi di Milano.

Dall' A.A. 1995-96 tiene il corso di Chimica Metallorganica (Catalisi Omogenea), inizialmente del Corso di Laurea quinquennale in Chimica e poi del Corso di Laurea Specialistica (ora Magistrale) in Scienze Chimiche.

Dall'A.A. 1998-99 al 2008-09 è stato titolare del corso di "Laboratorio di Chimica Generale e Inorganica" (Corso di laurea in Chimica).

Dall'A.A. 2009-10 è titolare del corso di Chimica Generale e Inorganica (Corso di laurea in Chimica)

E' stato uno dei due chairman dell' "XI Congresso Del Gruppo Interdivisionale di Chimica Organometallica (CoGICO2014)", Milano 2014.

E' stato parte del comitato organizzatore della 2nd Euchem Conference on Nitrogen Ligands in Organometallic Chemistry and Homogeneous Catalysis" (Como 9-14 Giugno 1996), dell'VIII Seminario Italiano di Catalisi (Pallanza - Verbania 19-24/06/05) e del XXXV Congresso della Divisione di Chimica Inorganica della SCI (Milano 3-7 Settembre 2007).

E' stato parte del comitato scientifico della 8th, della 9th della 10th e dell'11th International School of Organometallic Chemistry (ISOC 2011, ISOC 2013, ISOC2015, ISOC2017), di quello del X, XI e XII Congresso del Gruppo Interdivisionale di Chimica Organometallica, (COGICO 2012, Padova,

COGICO2014, Milano, COGICO2106, Genova) e del 9th International Symposium on Nano & Supramolecular Chemistry (Napoli, 2017).

E' stato responsabile di un'Unità di ricerca finanziata nell'ambito delle domande FIRB 2003, sul progetto "Membrane Catalitiche".

E' stato responsabile scientifico di due contratti di ricerca con l'Enichem, rispettivamente su "Impiego di Nuovi Promotori per il Sistema Catalitico Palladio-Fenantrolina per la Sintesi di Carbammati ed Uree da Nitroareni" e su "Cracking Selettivo di Correnti Olefiniche per la Produzione di Propilene" e di uno con la Techint su "Assorbimento di CO₂ e H₂S in solventi". Entrambi i contratti con l'Enichem hanno dato luogo al deposito di una domanda di brevetto. Dal 2006 al 2015 è stato il rappresentante dell'Università degli Studi di Milano all'interno del Consorzio Interuniversitario per la Reattività Chimica e la Catalisi (CIRCC).

Dal 2010 è membro del Consiglio Direttivo del Gruppo Interdivisionale di Chimica Organometallica della SCI e dal 2016 è il suo coordinatore.

Il Prof. Ragaini è autore di 119 articoli su rivista, tutti tranne cinque su riviste internazionali, di una monografia dal titolo "Catalytic Reductive Carbonylation of Organic Nitro Compounds" (pubblicata dalla Kluwer Academic Publishers), di due capitoli di libri, di 142 comunicazioni a congressi (di cui varie su invito), e di 3 Brevetti.

I lavori del Prof. Ragaini hanno raccolto più di 3000 citazioni (senza includere quelle della monografia, per cui il numero non è disponibile). h-index = 34.

Gli interessi scientifici sono nel campo della chimica organometallica e della catalisi omogenea. I campi in cui si è maggiormente, ma non esclusivamente, focalizzata l'attività di ricerca sono in particolare:

1) Reazioni di carbonilazione di nitroareni a dare prodotti della chimica di base (carbammati, uree, isocianati). Il sistema catalitico descritto dal Prof. Ragaini è il più attivo tra tutti quelli mai riportati per questo tipo di reazioni.

2) Reazioni di carbonilazione di nitroareni a dare prodotti della chimica fine (ammine alliliche, indoli, ossazine, pirroli). Insieme al Prof. Cenini, il Prof. Ragaini è stato il primo, nel 1996, a riportare la prima versione inter-molecolare di questo tipo di accoppiamenti, per i quali solo versioni intra-molecolari erano state descritte in precedenza. L'articolo sulla sintesi di indoli pubblicato sul JOC nel 2006 è tra i più scaricati per quella rivista in quell'anno. Nel 2017 il Prof. Ragaini ha riportato il primo esempio di reazione di questo genere in cui si utilizza un estere dell'acido formico al posto del CO, semplificando così la procedura sperimentale.

3) Sintesi ed uso di leganti azotati (specialmente basi di Schiff chelanti e fenantrolina). La sintesi di bis-arilimminoacenafteni (Ar-BIAN) descritta dal Prof. Ragaini è attualmente la più spesso utilizzata per questa classe di leganti il cui campo di applicazione continua ad ampliarsi rapidamente.

4) Amminazione e aziridinazione di olefine e C-H attivati (benzilici, allilici ecc.). Insieme al Prof. Cenini e alla Prof.ssa Gallo, il Prof. Ragaini è stato un pioniere dell'uso di arilazidi come agenti amminanti, un campo ora in rapida espansione.

5) Da alcuni anni è in corso una collaborazione con il Prof. Beller (Lickat, Rostock, Germania) su catalizzatori grafiteici ottenuti per decomposizione termica di opportuni complessi metallici con leganti azotati in presenza di altre matrici.

6) Una particolare attenzione viene data agli studi dei meccanismi di reazione in tutti i campi menzionati, come mezzo di aumentare razionalmente le prestazioni dei catalizzatori.

Monograph

S. Cenini, F. Ragaini

Catalytic Reductive Carbonylation of Organic Nitro Compounds

Kluwer Academic Publishers, Dordrecht, The Netherland, **1997**.

Articles

1) Effects of neutral ligands in the reductive carbonylation of nitrobenzene catalyzed by $\text{Ru}_3(\text{CO})_{12}$ and $\text{Rh}_6(\text{CO})_{16}$.

S. Cenini, M. Pizzotti, C. Crotti, F. Ragaini, F. Porta. *J. Mol. Catal.* **1988**, 49, 59-69.

2) Reactions of organic halides with the carbonyl anions $[\text{M}(\text{CO})_4]^-$ (M = Rh, Ir). The crystal and molecular structure of $[\text{PPN}][\text{IrBr}_2(\text{CO})_2(\text{CH}_2\text{CO}_2\text{Me})_2]$ and of $[\text{PPN}][\text{Ir}(\text{CO})_2(\text{CH}_2\text{CN})_2]$ ($\text{PPN}^+ = \text{Ph}_3\text{P}=\text{N}=\text{PPh}_3^+$).

F. Porta, F. Ragaini, S. Cenini, M. Pizzotti, F. Demartin. *Organometallics* **1990**, 9, 929-935.

3) Reactivity of hydroxo, hydroperoxo and peroxo platinum(II) derivatives towards carbon oxides.

F. Porta, F. Ragaini, S. Cenini, O. Sciacovelli, M. Camporeale. *Inorg. Chim. Acta* **1990**, 173, 229-235.

4) Synthesis and crystal structure of $[\text{PPh}_4]_2 [\text{Ir}_4(\text{CO})_{10}(\text{CH}_2\text{COOMe})_2]$ and $[\text{PPh}_4] [\text{Ir}_4(\text{CO})_{11}(\text{CH}_2\text{COOMe})]$. First examples of iridium clusters bearing an alkyl-like ligand.

F. Ragaini, F. Porta, F. Demartin. *Organometallics* **1991**, 10, 185-189.

5) Carbonylation of nitrobenzene to phenyl isocyanate and methyl carbamate catalyzed by palladium and rhodium activated by chelating nitrogen donor ligands.

S. Cenini, F. Ragaini, M. Pizzotti, F. Porta, G. Mestroni, E. Alessio. *J. Mol. Catal.* **1991**, *64*, 179-190.

6) Oxidation of primary and secondary aliphatic amines by $\text{Mo}(\text{O})(\text{O}_2)_2\text{L}'\text{L}''$ ($\text{L}' =$ hexamethylphosphoramide).

F. Porta, S. Tollari, F. Ragaini, C. Crotti. In *Dioxygen Activation and Homogeneous Catalytic Oxidation, Proceedings of the 4th International Symposium on Dioxygen Activation and Homogeneous Catalytic Oxidation*. L.I. Simándi (Ed.) Elsevier Sequoia, Amsterdam, **1991**, p. 531-536.

7) Synthesis of two novel pentanuclear Rhodium clusters bearing the alkyl-like ligands $-\text{CH}_2\text{COOMe}$ and $-\text{CH}_2\text{CN}$. X-ray structure of $[\text{PPh}_4]_2[\text{Rh}_5(\mu\text{-CO})_6(\text{CO})_8(\text{CH}_2\text{CN})]$.

F. Ragaini, F. Porta, A. Fumagalli, F. Demartin. *Organometallics* **1991**, *10*, 3785-3789.

8) $[\text{Rh}(\text{CO})_4]^-$, $[\text{Rh}_5(\text{CO})_{15}]^-$ and bimetallic clusters as catalysts for the carbonylation of nitrobenzene to methyl phenylcarbamate.

F. Ragaini, S. Cenini, A. Fumagalli, C. Crotti. *J. Organomet. Chem.* **1992**, *428*, 401-408.

9) Ruthenium carbonyl catalyzed deoxygenation by carbon monoxide of *o*-substituted nitrobenzenes. Synthesis of benzimidazoles.

C. Crotti, S. Tollari, F. Ragaini, S. Cenini, F. Porta. *J. Mol. Catal.* **1992**, *72*, 283-298.

10) Colloidal palladium: an improved method of preparation.

F. Porta, F. Ragaini, S. Cenini, G. Scari. *Gazz. Chim. Ital.* **1992**, *122*, 361-3.

11) Mechanistic studies of the carbonylation of nitrobenzene catalyzed by the $[\text{Rh}(\text{CO})_4]^-/\text{Bipy}$ system. X-ray structure of $[\text{PPN}][\text{Rh}(\text{CO})_2\text{ON}(\text{C}_6\text{H}_3\text{Cl}_2)\text{C}(\text{O})\text{O}]$.

F. Ragaini, S. Cenini, F. Demartin. *J. Chem. Soc., Chem. Commun.* **1992**, 1467-8.

12) Solving simple organometallic structures solely from X-ray powder diffraction data: the case of polymeric $[\text{Ru}(\text{CO})_4]_n$.

N. Masciocchi, M. Moret, P. Cairati, F. Ragaini, A. Sironi. *J. Chem. Soc., Dalton Trans.* **1993**, 471-5.

13) Ab initio XRPD structure determination of metal carbonyl clusters: the case of $[\text{HgRu}(\text{CO})_4]_4$.

N. Masciocchi, P. Cairati, F. Ragaini, A. Sironi. *Organometallics* **1993**, *12*, 4499-4502.

14) Reduction of nitrobenzene to aniline by $\text{CO}/\text{H}_2\text{O}$, catalyzed by $\text{Ru}_2(\text{CO})_{12}$. Strong activating ability of rigid α -diimine ligands.

F. Ragaini, S. Cenini, S. Tollari. *J. Mol. Catal.* **1993**, *85*, L1-L5

15) Synthesis of some benzotriazoles by deoxygenation of *o*-nitrophenylazocompounds by tertiary amines and CO.

M. Pizzotti, F. Ragaini, S. Cenini. *Gazz. Chim. Ital.* **1993**, *123*, 683-686.

16) Halide-induced disproportionation of $\text{Fe}_3(\text{CO})_{12}$ to form a radical anion $[\text{Fe}_3(\text{CO})_{11}]^{\cdot-}$ and its characterization by single-crystal X-ray diffraction.

F. Ragaini, D. L. Ramage, J-S. Song, G. L. Geoffroy, A. L. Rheingold. *J. Am. Chem. Soc.* **1993**, *115*, 12183-12184.

17) Mechanistic studies of the carbonylation of nitrobenzene catalyzed by the $[\text{Rh}(\text{CO})_4]^-$ / nitrogen base system. X-ray structure of $[\text{PPN}][\text{Rh}(\text{CO})_2\text{ON}(\text{C}_6\text{H}_3\text{Cl}_2)\text{C}(\text{O})\text{O}]$.

F. Ragaini, S. Cenini, F. Demartin. *Organometallics* **1994**, *13*, 1178-1189.

18) Intramolecular amination of olefins. Synthesis of 2-substituted-4-quinolones from 2-nitrochalcones catalyzed by ruthenium.

S. Tollari, S. Cenini, F. Ragaini, L. Cassar. *J. Chem. Soc., Chem. Commun.* **1994**, 1741-1742.

19) Radical processes in the reduction of nitrobenzene promoted by iron carbonyl clusters. X-ray crystal structures of $[\text{Fe}_3(\text{CO})(\mu_3\text{-NPh})]^2-$, $[\text{HFe}_3(\text{CO})_9(\mu_3\text{-NPh})]^-$, and the radical anion $[\text{Fe}_3(\text{CO})_{11}]^{\cdot-}$.

F. Ragaini, J.-S. Song, D. L. Ramage, G.L. Geoffroy, A. L. Rheingold. *Organometallics* **1995**, *14*, 387-400.

20) New chelating nitrogen ligands. X-ray crystal structure of $\text{Rh}(\text{CO})_2(\text{BBOM})$ (BBOMH= bis-(2-benzoxazolil)methane).

F. Ragaini, M. Pizzotti, S. Cenini, A. Abbotto, G. A. Pagani, F. Demartin. *J. Organomet. Chem.* **1995**, *489*, 107-112.

21) Homogeneous catalysis in water without charged ligands. Reduction of nitrobenzene to aniline by $\text{CO}/\text{H}_2\text{O}$ catalysed by $[\text{Rh}(\text{CO})_4]^-$.

F. Ragaini, S. Cenini. *J. Mol. Catal. A.* **1996**, *105*, 145-148.

22) Mechanistic studies of palladium-catalysed carbonylation reactions of nitro compounds to isocyanates, carbamates and ureas.

F. Ragaini, S. Cenini. *J. Mol. Catal. A* **1996**, *109*, 1-25.

23) Mechanistic study of the phase-transfer-catalyzed reduction of nitrobenzene to aniline by iron carbonyl complexes. Role of the radical anion $[\text{Fe}_3(\text{CO})_{11}]^{\cdot-}$.

F. Ragaini. *Organometallics* **1996**, *15*, 3572-3578.

24) Allylic Amination of Cyclohexene Catalysed by Ruthenium Complexes. A New Reaction Involving an *inter*-Molecular Catalytic C-H Functionalization.

S. Cenini, F. Ragaini, S. Tollari, D. Paone. *J. Am. Chem. Soc.* **1996**, *118*, 11964-11965.

25) Catalytic carbonylation reactions of organic nitro compounds. A route alternative to the use of phosgene.

F. Ragaini, S. Cenini. *Chim. Ind.(Milano)* **1996**, *78*, 421-427.

26) Activation of the N-H bond of ethyl urethane and urea by ruthenium hydride complexes. Unexpected loss of alcohol or ammonia to yield isocyanato complexes and the X-ray crystal structure of *cis,trans*-HRu(NCO)(CO)₂(PPh₃)₂.

F. Ragaini, T. Longo, S. Cenini, F. Demartin. *J. Chem. Soc., Dalton Trans.* **1996**, 3221-3226.

27) Transition metal-mediated N-heterocyclisation reactions. Synthesis of 2-phenylindole by reduction by CO of 2-nitrostilbene catalysed by [Rh(CO)₄]⁻.

F. Ragaini, S. Tollari, S. Cenini, E. Bettetini. *J. Mol. Catal. A* **1996**, *111*, 91-96.

28) Addition of ethyl urethane to olefins; a new approach to the synthesis of aliphatic carbamates.

F. Ragaini, T. Longo, S. Cenini. *J. Mol. Catal. A* **1996**, *110*, L171-L175.

29) Processi chimici puliti per il futuro. Studi meccanicistici sulla sintesi di uree e di carbammati da nitroderivati aromatici e ossido di carbonio catalizzata da complessi carbonilici del rutenio.

F. Ragaini, A. Ghitti, S. Cenini. *Rendiconti dell'Istituto Lombardo di Scienze e Lettere, B*, **1996**, *130*, 207-217.

30) Carbonylation of nitrobenzene catalysed by palladium and heteropolyanions; a mechanistic approach.

F. Ragaini, M. Macchi, S. Cenini. *J. Mol. Catal. A* **1997**, *127*, 33-42.

31) Use of Imino Grignard Reagents in Inorganic Chemistry. Synthesis and X-Ray Crystal Structure of [Pd(Cl)(Py)(μ-2,6-PrⁱC₆H₃NH)]₂.

F. Ragaini, S. Cenini, F. Demartin. *J. Chem. Soc., Dalton Trans.* **1997**, 2855-6

32) Ab Initio XRPD Structure Determination of Organometallic Compounds: the case of Pd(Phen)(C(O)N(Me)OC(O)), a Model Intermediate in the Palladium-Phenanthroline-Catalyzed Reductive Carbonylation of Aromatic Nitro Compounds.

N. Masciocchi, F. Ragaini, S. Cenini, A. Sironi. *Organometallics* **1998**, *17*, 1052-1057.

33) Intermediate Formation of Anilines in the Synthesis of Schiff Bases from Nitroarenes and Aldehydes.

F. Ragaini, S. Cenini. *J. Mol. Catal. A* **1999**, *144*, 405-410.

34) Investigation of the Possible Role of Arylamine Formation in the *ortho*-Substituted Nitroarene Reductive Cyclisation Reactions to Afford Heterocycles.

F. Ragaini, P. Sportiello, S. Cenini. *J. Organomet. Chem.* **1999**, 577, 283-291.

35) The Role of the Co-catalyst in the Reductive Carbonylation of Aromatic Nitro Derivatives Catalyzed by Transition Metal Carbonyl Clusters.

S. Cenini, F. Ragaini. In *Metal Clusters in Chemistry*, Vol. 2, capitolo 4, p. 697-714, Wiley-VCH, Weinheim (Germania), **1999**.

36) Allylic Amination of Unactivated Olefins by Nitroarenes, Catalysed by Ruthenium Complexes. A Reaction Involving an Intermolecular C-H Functionalization.

F. Ragaini, S. Cenini, S. Tollari, G. Tummolillo, R. Beltrami. *Organometallics* **1999**, 18, 928-942.

37) Mechanistic Study of the Ru₃(CO)₁₂/Tetraalkylammonium Chloride Catalyzed Carbonylation Reactions of Nitroarenes to Carbamates and Ureas; a Completely Revised Picture.

F. Ragaini, A. Ghitti, S. Cenini. *Organometallics* **1999**, 18, 4925-4933.

38) Investigation of the Reactivity of Palladium(0) Complexes with Nitroso Compounds: Relevance to the Palladium-Phenanthroline Catalysed Carbonylation Reactions of Nitroarenes.

E. Gallo, F. Ragaini, S. Cenini, F. Demartin. *J. Organomet. Chem.* **1999**, 586, 190-195

39) Promotion of the [PPN][Rh(CO)₄] Catalysed Carbonylation of Nitrobenzene by 2-Hydroxypyridine and Related Molecules: an Apparent Bifunctional Activation.

F. Ragaini, E. Gallo, S. Cenini. *J. Organomet. Chem.* **2000**, 593-594, 109-118.

40) Mechanistic Study of the Ru₃(CO)₁₂/Chloride Catalyzed Carbonylation Reactions of Nitroarenes to Carbamates and Ureas; the Role of the Alkylammonium Cation.

F. Ragaini, S. Cenini. *J. Mol. Catal. A* **2000**, 161, 31-38.

41) Deactivation of a [PPN][Rh(CO)₄]-Based Catalytic System (PPN⁺ = (PPh₃)₂N⁺). The First Decomposition Reaction of PPN⁺ and the Formation of [Rh₁₀P(CO)₂₂]³⁻.

F. Ragaini, A. Sironi, A. Fumagalli. *Chem. Commun.* **2000**, 2117-2118.

42) Amination of Benzylic C-H Bonds by Aryl Azides Catalysed by Co^{II}(porphyrin) complexes. A New Reaction Leading to Secondary Amines and Imines.

S. Cenini, E. Gallo, A. Penoni, F. Ragaini, S. Tollari. *Chem. Commun.* **2000**, 2265-2266.

43) Reduction of Nitrobenzene to Aniline by CO/H₂O, Catalysed by Ru₃(CO)₁₂/Chelating Diimines

F. Ragaini, S. Cenini, M. Gasperini. *J. Mol. Catal. A* **2001**, *174*, 51-57.

44) Synthesis of N-Arylpyrroles, Hetero Diels-Alder Adducts, and Allylic Amines by Reaction of Unfunctionalized Dienes with Nitroarenes and Carbon Monoxide, Catalyzed by Ru(CO)₃(Ar-BIAN).

F. Ragaini, S. Cenini, E. Borsani, M. Dompé, E. Gallo, M. Moret. *Organometallics* **2001**, *20*, 3390-3398.

45) Synthesis of Ar-BIAN Ligands (Ar-BIAN = bis(aryl)acenaphthenequinonediimine) Having Strong Electronwithdrawing Substituents on the Aryl Rings and their Relative Coordination Strength towards Pd(0) and Pd(II) Complexes.

M. Gasperini, F. Ragaini, S. Cenini, *Organometallics* **2002**, *21*, 2950-2957.

46) The Crystal Structure of the Organometallic Polymer [Pd{CH₂C(O)Me}Cl]_n, determined by X-ray Powder Diffraction Methods.

N. Masciocchi, F. Ragaini, A. Sironi. *Organometallics* **2002**, *21*, 3489-92.

47) Le Metalloporfirine: un Efficace Modello di Enzimi Naturali. Studio Meccanicistico della Reazione Catalitica di Amminazione di Gruppi Benzilici.

E. Gallo, F. Ragaini, A. Penoni, E. Mangioni, S. Cenini. *Rendiconti dell'Istituto Lombardo di Scienze e Lettere, B* **2001**, *135*, 241-54 (printed in 2003).

48) Synthesis of Oxazines and N-Arylpyrroles by Reaction of Unfunctionalized Dienes with Nitroarenes and Carbon Monoxide, Catalyzed by Palladium-Phenanthroline Complexes.

F. Ragaini, S. Cenini, D. Brignoli, M. Gasperini, E. Gallo. *J. Org. Chem.* **2003**, *68*, 460-6.

49) Amination of Benzylic C-H Bonds by Arylazides Catalyzed by Co^{II}(porphyrin) Complexes. A Synthetic and Mechanistic Study.

F. Ragaini, A. Penoni, E. Gallo, S. Tollari, C. Li Gotti, M. Lapadula, E. Mangioni, S. Cenini. *Chem. Eur. J.* **2003**, *9*, 249-259.

50) Cyclopropanation of Olefins with Diazoalkanes Catalyzed by Co(II)(porphyrin) Complexes. A Synthetic and Mechanistic Investigation and the Molecular Structure of Co(III)(TPP)(CH₂CO₂Et) (TPP=Dianion of *meso*-Tetraphenylporphyrin)

A. Penoni, R. Wanke, S. Tollari, E. Gallo, D. Musella, F. Ragaini, F. Demartin, S. Cenini. *Eur. J. Inorg. Chem.* **2003**, 1452-60.

51) Carbonylation of Nitrobenzene to N-Methyl Phenylcarbamate Catalyzed by Palladium-Phenanthroline Complexes. Bifunctional Activation by Anthranilic Acid.

M. Gasperini, F. Ragaini, S. Cenini, E. Gallo. *J. Mol. Catal. A* **2003**, *204-205*, 107-114.

52) The Carbonylation Reaction of Nitrobenzene to Methyl Phenylcarbamate; New Highly Efficient Promoters for the Palladium-Phenanthroline Catalytic System Based on Phosphorus Acids.

F. Ragaini, C. Cognolato, M. Gasperini, S. Cenini. *Angew. Chem. Int. Ed.* **2003**, *42*, 2886-89; *Angew. Chem.* **2003**, *115*, 2992-95.

53) Method of Establishing the Lewis Acidity of a Metal Fragment Based on the Relative Binding Strength of Ar-BIAN Ligands (Ar-BIAN = Bis(aryl)acenaphthenequinonediimine).

M. Gasperini, F. Ragaini. *Organometallics* **2004**, *23*, 995-1001.

54) Phosphorus Acids as Highly Efficient Promoters for the Palladium-Phenanthroline Catalyzed Carbonylation of Nitrobenzene to Methyl Phenylcarbamate.

F. Ragaini, M. Gasperini, S. Cenini. *Adv. Synth. Catal.* **2004**, *346*, 63-71.

55) Allylic Amination of Unfunctionalized Olefins by Nitroarenes and CO, Catalyzed by Ru₃(CO)₁₂/Ph-BIAN (Ph-BIAN = bis(phenylimino)acenaphthenequinone): Extension to the Synthesis of Allylic Amines with Strongly Electronwithdrawing or Electron donating Groups on the Aryl Ring.

F. Ragaini, S. Cenini, F. Turra, A. Caselli. *Tetrahedron* **2004**, *60*, 4989-4994.

56) Synthesis of mixed Ar,Ar'-BIAN Ligands (Ar-BIAN = bis(aryl)acenaphthenequinonediimine). Measurement of the Coordination Strength of Hemilabile Ligands with Respect to Their Symmetrical Counterparts.

M. Gasperini, F. Ragaini, E. Gazzola, A. Caselli, P. Macchi. *Dalton Trans.* **2004**, 3376-3382.

57) Copper Catalysed 1,4-Addition of Organozinc Reagents to α,β -Unsaturated Carbonyl Compounds: A Mechanistic Investigation.

E. Gallo, F. Ragaini, L. Bilello, S. Cenini, C. Gennari, U. Piarulli. *J. Organomet. Chem.* **2004**, *689*, 2169-2176.

58) Synthesis of Triarylphosphines Having *para* -SH and -SMe Groups. Preparation of Their Complexes and Formation of a Monolayer on a Gold Surface.

F. Ragaini, L. Lunardi, D. Tomasoni, V. Guglielmi. *J. Organomet. Chem.* **2004**, *689*, 3621-3630.

59) Structural Determination of Ruthenium Porphyrin Complexes Relevant to Catalytic Epoxidation of Olefins.

E. Gallo, A. Caselli, F. Ragaini, S. Fantauzzi, N. Masciocchi, A. Sironi, S. Cenini. *Inorg. Chem.* **2005**, *44*, 2039-2049.

60) Carbonylation of Dinitrotoluene to Dimethyl Toluendicarbamate; High Efficiency of Phosphorus Acids as Promoters for the Palladium-Phenanthroline Catalytic System.

M. Gasperini, F. Ragaini, C. Cazzaniga, S. Cenini. *Adv. Synth. Catal.* **2005**, *347*, 105-120.

61) Using Ring Strain to Inhibit a Decomposition Path: First Synthesis of an Alkyl-BIAN ligand (Alkyl-BIAN = bis(alkyl)acenaphthenequinonediimine)

F. Ragaini, M. Gasperini, E. Gallo, P. Macchi. *Chem. Commun.* **2005**, 1031-1033.

62) Catalytic Amination Reactions Mediated by Co(II) Schiff Base Complexes.

A. Caselli, E. Gallo, F. Ragaini, A. Opezzo, S. Cenini. *J. Organomet. Chem.* **2005**, *690*, 2142-2148.

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