



**Alessandro Fumagalli**

 UNIVERSITY OF INSUBRIA



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## Contact data

### Associate Professor of General and Inorganic Chemistry

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## Biography

1974 Degree in Chemistry (University of Milan, 110/110 magna cum Laude)

1975 Visiting Researcher (7 months) at the University of Kent at Canterbury (UK).

1976 Permanent Position as Research Scientist, at the CSMTBO Center of the National Council of Research (CNR), Milano

1978-1980 (19 months, on leaving absence from CNR) Post doctoral Position at the Brookhaven National Laboratory, Upton N.Y., USA.

1988 Permanent Position as Senior Research Scientist at CNR

1998 Permanent Position as Associate Professor of General and Inorganic Chemistry, at the School of Sciences of the University of Insubria - Varese, Italy.

## Qualifications and awards

1974 State Examination for Professional Habilitation

1989–1998 Member of the Scientific Board of the CNR Center CSMTBO and Scientific Coordinator (1995–1998) of the research project "Synthesis, chemical and physico-chemical properties of metal cluster compounds".

1996–2001 Member of the Scientific Board of the CNR Institute IATCAPA - Sassari, Italy.

## Research interests

More than 70 papers, published on high impact-factor international journals, have been produced, in the following fields:

- Synthesis, structural characterization (NMR) and applications (homogeneous catalysis) of metal-carbonyl cluster compounds.
- Interactions of low-valent metals with biologically relevant molecules.
- Environmental Chemical Analysis– trace metal detection.

## Teaching experience and appointments

1998-present: General and Inorganic Chemistry (Biology, Natural Sciences and Biotechnologies)

1999-2002 and 2004: General and Inorganic Chemistry (Biology of Health)

2002-present: Inorganic and Bioinorganic Chemistry (graduate level degree in Biology)

2002-present: Analytical Chemistry, 1 module (Biology and Biotechnologies)

2003-present: General and Inorganic Chemistry (Engineering)

## Representative publications

2001-present: Member of the Technical–Scientific Board of the “Central Instrument School for Biomedical Research” of the University of Insubria - Varese (Italy).

2002-present: Member of the Scientific Board of the “Centro di Ricerca sul Lago di Varese e sulle risorse ambientali locali” of the University of Insubria - Varese (Italy).

1. WATER SECURITY IN UZBEKISTAN: IMPLICATION OF RETURN WATERS ON THE AMU DARYA WATER QUALITY  
Giuseppe Crosa, Fabrizio Stefani, Camilla Bianchi and Alessandro Fumagalli *ESPR*, 2006 in press.
2. A NEW MULTIVALENT CLUSTER: SYNTHESIS, ELECTROCHEMISTRY, SOLID STATE STRUCTURE AND COMPUTATIONAL STUDIES ON THE IRON-NICKEL MIXED-METAL NITRIDE ANIONS  $[\text{Fe}_6\text{Ni}_6\text{N}_2(\text{CO})_{24}]^{n-}$  ( $n = 2, 3, 4$ ). Roberto Della Pergola, Maurizio Bruschi, Fabrizia Fabrizi de Biani, Alessandro Fumagalli, Luigi Garlaschelli, Franco Laschi, Mario Manassero, Mirella Sansoni, and Piero Zanello *C. R. Chimie*, 2005, 8, 1850-1855.
3. CARBONYL-NITRIDO MIXED-METAL CLUSTERS: SYNTHESIS, REACTIVITY, ELECTROCHEMICAL BEHAVIOR AND SOLID-STATE STRUCTURE OF  $[\text{Co}_5\text{MoN}(\text{CO})_{14}]^{2-}$  AND  $[\text{Co}_5\text{MoN}(\text{CO})_{14}\text{AuPPh}_3]^-$  Roberto Della Pergola, Alessandro Fumagalli, Fabrizia Fabrizi de Biani, Luigi Garlaschelli, Franco Laschi, Maria Carlotta Malatesta, Mario Manassero, Elena Roda, Mirella Sansoni and Piero Zanello *Eur. J. Inorg. Chem.*, 2004, 3901-3906.
4. ELECTRON TRANSFER AND CO ADDITION TO POLYNITRIDO COBALT CARBONYL CLUSTERS: PARALLEL PATHWAYS FOR CONVERSION OF THE  $[\text{Co}_{10}\text{N}_2(\text{CO})_{19}]^{4-}$  ANION TO THE NOVEL  $[\text{Co}_{11}\text{N}_2(\text{CO})_{21}]^{3-}$  ANION. Alessandro Fumagalli,\* Paola Ulivieri, Michela Costa, Ornella Crispu, Roberto Della Pergola, Fabrizia Fabrizi de Biani, Franco Laschi, Piero Zanello, Piero Macchi, Angelo Sironi\*, *Inorg.Chem.*, 2004, 43, 2125-2131..
5. SYNTHESIS, STRUCTURAL AND ELECTROCHEMICAL CHARACTERIZATION OF THE NITRIDO-CARBONYL CLUSTER ANION  $[\text{Co}_{13}\text{N}_2(\text{CO})_{24}]^{3-}$ . THE DIFFERENT REDOX PROPENSITY OF THE TWO ISOSTRUCTURAL FAMILIES  $[\text{Co}_{13}\text{N}_2(\text{CO})_{24}]^{n-}$  AND  $[\text{Co}_{13}\text{C}_2(\text{CO})_{24}]^{m-}$ . Alessandro Fumagalli,\* Michela Costa, Roberto Della Pergola, Piero Zanello, Fabrizia Fabrizi de Biani, Piero Macchi, Angelo Sironi\*, *Inorg.Chim.Acta*, 2003, 350, 187-192.
6. SYNTHESIS AND STRUCTURAL CHARACTERIZATION OF THE  $\{[\text{Rh}_5(\text{CO})_{14}]-(\text{H}_2\text{N}(\text{CH}_2)_4\text{NH}_2)-[\text{Rh}_5(\text{CO})_{14}]\}^{2-}$  AND  $[\text{Rh}_5(\text{CO})_{13}(\text{H}_2\text{N}(\text{CH}_2)_2\text{NH}_2)]^-$  ANIONS (AS  $[\text{PPh}_4]^+$  SALTS): AN UNPRECEDENTED EXAMPLE OF CARBONYL SUBSTITUTION BY ALKYL AMINES IN A HOMOLEPTIC METAL CARBONYL CLUSTER ANION. A. Fumagalli,\* M. C. Malatesta, A. Tentori, D. Monti, P. Macchi, and A. Sironi\*, *Inorg. Chem*, 2002, 41, 76-85.
7. MIXED RUTHENIUM-IRIDIUM CARBONYL CLUSTER COMPLEXES. SYNTHESIS OF THE ANIONS  $[\text{Ru}_3\text{Ir}_2(\text{CO})_{14}]^{2-}$  AND

[Ru<sub>3</sub>Ir<sub>2</sub>(CO)<sub>14</sub>H]<sup>-</sup> AND CRYSTAL STRUCTURES OF THEIR [TETRAPHENYLPHOSPHONIUM]<sup>+</sup> SALTS A. Fumagalli,\* M. C. Malatesta, M. Vallario, G. Ciani, M. Moret, and A. Sironi\*, *J. Cluster Science*, 2001, 12, 187.

8. SKELETAL GROWTH BY CONDENSATION OF SMALL METAL FRAGMENTS ON A CARBIDO CARBONYL CLUSTER. SYNTHESIS OF THE ANIONS [Rh<sub>15</sub>C<sub>2</sub>(CO)<sub>24</sub>X<sub>2</sub>]<sup>3-</sup> (X = Cl, Br, I) AND MOLECULAR STRUCTURE OF THE BROMO AND IODO DERIVATIVES A. Fumagalli,\* S. Martinengo, G. Bernasconi, L. Noziglia, V. G. Albano\*, M. Monari, and C. Castellari, *Organometallics*, 2000, 19, 5149-5154.

9. SYNTHESIS AND PROPERTIES OF METAL CARBONYL CLUSTERS CONTAINING NITRIDO LIGANDS. By A. Fumagalli\* and R. Della Pergola, Cap 1.18 di *Metal Clusters in Chemistry*, Braunstein, Oro, Raithby Ed.s, Wiley-VCH (1999), 323-347.

10. SYNTHESIS AND STRUCTURAL CHARACTERIZATION OF THE NITRIDO-CARBONYL CLUSTER ANION [Co<sub>10</sub>N<sub>2</sub>(CO)<sub>9</sub>(μ-CO)<sub>10</sub>]<sup>4-</sup> HAVING AN UNPRECEDENTED METAL CAGE BUILT OF THREE CONDENSED TRIGONAL PRISMS A. Fumagalli\*, S. Martinengo, M. Tasselli, G. Ciani, P. Macchi, and A. Sironi\*, *Inorg. Chem.*, (1998), 37, 2826-2828.

11. [Rh<sub>28</sub>N<sub>4</sub>(CO)<sub>41</sub>H<sub>x</sub>]<sup>4-</sup>, A MASSIVE CARBONYL CLUSTER WITH FOUR INTERSTITIAL NITROGEN ATOMS A. Fumagalli\*, S. Martinengo, G. Bernasconi, G. Ciani, D. M. Proserpio and A. Sironi\*, *J. Am. Chem. Soc.*, (1997), 119, 1450-1451.

12. MIXED RUTHENIUM-RHODIUM CARBONYL CLUSTERS. SYNTHESIS AND CRYSTAL STRUCTURE OF THE [PPh<sub>4</sub>]<sup>+</sup> SALTS OF THE ANIONS [Ru<sub>2</sub>Rh<sub>2</sub>(CO)<sub>7</sub>(μ-CO)<sub>5</sub>]<sup>2-</sup>, [Ru<sub>2</sub>Rh<sub>2</sub>(CO)<sub>9</sub>(μ-CO)<sub>3</sub>(μ-H)]<sup>-</sup>, AND [Ru<sub>2</sub>Rh<sub>2</sub>(CO)<sub>7</sub>(μ-CO)<sub>5</sub>(μ<sub>3</sub>-AuPPh<sub>3</sub>)]<sup>-</sup> A. Fumagalli\*, D. Italia, M. C. Malatesta, G. Ciani, M. Moret and A. Sironi\*, *Inorg. Chem.*, (1996), 35, 1765-1772.

13. REVERSIBLE SKELETAL REARRANGEMENT IN A CARBIDO CARBONYL CLUSTER INDUCED BY LIGAND SUBSTITUTION. SYNTHESIS AND CRYSTAL STRUCTURE OF THE ANION [Rh<sub>12</sub>C<sub>2</sub>(CO)<sub>23</sub>(AuPPh<sub>3</sub>)]<sup>-</sup> V. G. Albano\*, A. Fumagalli\*, F. Grepioni, S. Martinengo, and M. Monari, *J. Chem. Soc., Dalton Trans.*, (1994), 1777-1782.

14. ISOSKELETAL Rh<sub>10</sub>C<sub>2</sub> METAL CLUSTERS CONTAINING FOUR Au(PPh<sub>3</sub>) GROUPS AND A VARIABLE NUMBER OF CARBONYL LIGANDS A. Fumagalli\*, S. Martinengo, V. G. Albano\*, D. Braga and F. Grepioni, *J. Chem. Soc., Dalton Trans.*, (1993), 2047-2052.

15. MIXED PLATINUM-RHODIUM CARBONYL CLUSTERS. THE ISOLATION OF [Pt<sub>4</sub>Rh<sub>18</sub>(CO)<sub>35</sub>]<sup>4-</sup>, AN EXAMPLE OF CHERRY-LIKE CLUSTER WITH A SEMIEXPOSED TETRAPLATINUM CORE A. Fumagalli\*, S. Martinengo, G. Ciani, N. Masciocchi and A. Sironi\*,

*Inorg. Chem.*, (1992), 31, 336-340.

16. SYNTHESIS AND CHARACTERIZATION OF HETEROMETALLIC CARBONYL CLUSTER ANIONS A. Fumagalli,\* *Mater. Chem. and Phys.*, (1991), 29, 211-220.
17. REACTIVITY OF  $\text{Rh}_4(\text{CO})_{12}$  WITH HALIDES OR PSEUDOHALIDES; SYNTHESIS OF THE PENTANUCLEAR CARBONYL CLUSTERS  $[\text{Rh}_5(\text{CO})_{14}\text{X}]^{n-}$  (X = Cl, Br, I, SCN, n = 2; X =  $\text{PPh}_3$ , n = 1). CRYSTAL STRUCTURES OF  $[\text{N}(\text{PPh}_3)_2][\text{Rh}_5(\mu\text{CO})_6(\text{CO})_8(\text{PPh}_3)]$  AND  $[\text{N}(\text{PPh}_3)_2][\text{Rh}_5(\mu\text{CO})_6(\text{CO})_8(\text{SCN})]$  A. Fumagalli\*, S. Martinengo, D. Galli, C. Allevi, G. Ciani and A. Sironi\*, *Inorg. Chem.*, (1990), 29, 1408-1413.
18. SALTS OF MIXED PLATINUM-TETRARHODIUM CLUSTER COMPLEXES A. Fumagalli\* and S. Martinengo, *Inorganic Syntheses*, (1989), 26, 372-376.
19. 72-76 VALENCE ELECTRON CLUSTERS; AN EXTENSION OF THE 16-18 ELECTRON RULE. SYNTHESIS, CRYSTAL STRUCTURE AND SOLUTION DYNAMICS OF THE TRIGONAL BIPYRAMIDAL PENTANUCLEAR CLUSTERS  $[\text{PtIr}_4(\text{CO})_9(\mu\text{-CO})_5]^{2-}$  AND  $[\text{PtIr}_4(\text{CO})_9(\mu\text{-CO})_3]^{2-}$  A. Fumagalli,\* R. Della Pergola, F. Bonacina, L. Garlaschelli, M. Moret and A. Sironi,\* *J. Am. Chem. Soc.*, (1989), 111, 165-173.
20. MIXED-METAL CARBIDO CARBONYL CLUSTERS. PART 3. SYNTHESIS AND STRUCTURAL CHARACTERIZATION OF  $[\text{Rh}_6\text{C}(\text{CO})_{15}\{\text{Ag}(\text{NCMe})_2\}_2] \cdot 0.5 \text{ MeOH}$ ,  $[\text{Rh}_6\text{C}(\text{CO})_{15}\{\text{M}(\text{PPh}_3)\}_2]$  (M = Cu, Ag, or Au), AND OF THE ANION  $[\text{Rh}_6\text{C}(\text{CO})_{15}\{\text{Au}(\text{PPh}_3)\}]^-$  AS ITS  $\text{PPh}_4^+$  SALT A. Fumagalli\*, S. Martinengo, V. G. Albano\* and D. Braga, *J. Chem. Soc., Dalton Trans.*, (1988), 1237-1247.
21. A CASE OF SOLID-STATE ISOMERISM FOR A RHODIUM CARBONYL CLUSTER ANION. SYNTHESIS, CHARACTERIZATION IN SOLUTION AND X-RAY CRYSTALLOGRAPHIC STRUCTURES OF THE SALTS  $[\text{NMe}_4]_3[\text{Rh}_{11}(\text{CO})_{23}] \cdot \text{Me}_2\text{CO}$  AND  $[\text{NMe}_4]_3[\text{Rh}_{11}(\text{CO})_{23}] \cdot \text{C}_6\text{H}_5\text{Me}$  A. Fumagalli\*, S. Martinengo, G. Ciani\*, A. Sironi, B. T. Heaton, *J. Chem. Soc., Dalton Trans.*, (1988), 163-169.
22. MIXED PLATINUM-RHODIUM CARBONYL CLUSTERS. SYNTHESIS, REACTIVITY, AND CHEMICAL CHARACTERIZATION OF THE  $[\text{PtRh}_8(\mu_3\text{-CO})_3(\mu\text{-CO})_9(\text{CO})_7]^{2-}$  ANION AND X-RAY CRYSTAL STRUCTURE OF ITS TETRAETHYLAMMONIUM SALT A. Fumagalli,\* S. Martinengo, G. Ciani\* and G. Marturano, *Inorg. Chem.*, (1986), 25, 592-595.
23. MIXED Pt-Rh CARBONYL CLUSTERS. 1. SYNTHESIS, REACTIVITY AND SOLUTION STRUCTURES OF  $[\text{PtRh}_5(\text{CO})_{15}]^-$ ,  $[\text{PtRh}_4(\text{CO})_{14}]^{2-}$ , AND  $[\text{PtRh}_4(\text{CO})_{12}]^{2-}$  A. Fumagalli,\* S. Martinengo, P. Chini, D. Galli, B. T. Heaton and R. Della Pergola, *Inorg. Chem.*, (1984), 23, 2947-2954.
24. HIGH NUCLEARITY Pt-Rh CARBONYL CLUSTERS.

SYNTHESIS AND X-RAY CHARACTERIZATION OF THE  $[\text{Pt}_2\text{Rh}_{11}(\mu\text{-CO})_{12}(\text{CO})_{12}]^{3-}$  AND  $[\text{PtRh}_{12}(\mu\text{-CO})_{12}(\text{CO})_{12}]^{4-}$  ANIONS A.  
Fumagalli,\* S. Martinengo and G. Ciani,\* *J. Chem. Soc., Chem. Commun.*, (1983), 1381-1383.

25. ISOLATION AND CHARACTERIZATION OF  $[\text{Rh}_5(\text{CO})_{10}(\mu_2\text{-CO})_5]^-$ : A KEY PRODUCT IN RHODIUM CARBONYL CHEMISTRY A.  
Fumagalli, T. F. Koetzle,\* F. Takusagawa, P. Chini,\* S. Martinengo and B. T. Heaton,\* *J. Am. Chem. Soc.*, (1980), 102, 1740-1742.