



# Pietro Manfrinetti

Associate professor

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## *Education and training*

1984

### **Post Doc. Materials Science and Engineering**

The phase equilibria in the La-Mg and Gd-Mg systems  
Iowa State University. Ames Iowa. USA - Ames Iowa - US

1980

### **Laurea in Chimica**

Study of the Th-Cd phase diagram - 110/110 e Lode  
Universita' di Genova - Genova - IT

## *Academic experience*

2015 - ONGOING

### **Professore Associato**

Universita' di Genova - Genova - IT

1992 - 2014

### **Ricercatore TI (tempo indeterminato)**

Universita' di Genova - Genova - IT

1984 - 1985

### **Post-doctoral fellow. Department of Materials Science and Engineering**

Iowa State University - Ames Iowa. - US

1981 - 1983

### **Research associate. Institute of Physical Chemistry**

University of Genova - Genova - IT

## *Work experience*

1985 - 1991

### **Responsible of the Analytical Laboratory Responsible Quality Control**

Roquette Freres Italia S.p.A. - Cassano Spinola (Al) - IT  
Analytical control. Quality control of the Plant

## *Language skills*

**English**

Proficient

**French**

Independent

## *Teaching activity*

### **Teaching and tutoring duties**

Actively involving both teaching as well as scientific research in the field of Inorganic and Physical Chemistry since 1981 to present; mostly:

1. Assistant to the laboratory of General and Inorganic Chemistry for students in Geology (at the Department of Chemistry, University of Genova).
2. Teaching theoretical and laboratory courses of Physical-Chemistry for the Degree in "*Chemistry and Chemical Technologies*" and "*Materials Science*".
3. Teaching theoretical/practical classes in Physical-Chemistry methodologies and Instrumental Analytical-Chemistry methodologies for different Degrees in Cultural Heritage Science.
4. Tutoring undergraduate and graduate students in their thesis for Degrees in Chemistry, Materials Science, Cultural Heritage Degrees, and Bachelor and Master students.
5. Tutoring of PhD students in their thesis work.
6. Supervising of Post-Doc fellows

## *Postgraduate research and teaching activity*

### **Supervision of PhD students, residents and post-doctoral fellows**

Tutoring of PhD students and of Post-doc associates in their PhD works and researches.

### **PhD committees membership**

Ateneo: **Università degli Studi di GENOVA**

Titolo: **"SCIENZE E TECNOLOGIE DELLA CHIMICA E DEI MATERIALI"**

Anno accademico di inizio: **2018/2019** - Ciclo: **34**

Ateneo proponente: **Università degli Studi di GENOVA**

Titolo: **"SCIENZE E TECNOLOGIE DELLA CHIMICA E DEI MATERIALI"**

Anno accademico di inizio: **2017/2018** - Ciclo: **33**

Ateneo proponente: **Università degli Studi di GENOVA**

Titolo: **"SCIENZE E TECNOLOGIE DELLA CHIMICA E DEI MATERIALI"**

Anno accademico di inizio: **2016/2017** - Ciclo: **32**

## *Research interests*

### Scientific background and interests

Primary research interest and experience is on synthesis of new materials on the basis of the elemental atomic properties (valence, atomic size, electronegativity), to check for the formation of new metallic or semimetallic compounds (and the reasons why a phase, having a given stoichiometry and crystal structure, is formed) and the correlations between their crystal chemistry and resulting physical properties. Interest and curiosity towards the search for rare-earth and transition metals based compounds, showing **exploitable and technologically suitable physical properties**.

### Research activity

The scientific research has been focusing on the synthesis and characterization of new and promising inorganic phases, metallic and semimetallic (rare-earths, transition metals and p-block elements based), with the aim to discover new and more outstanding materials. The research activity is devoted to investigate superconducting and magnetic compounds, as well as highly refractory, hard and/or light, alloys and materials. In particular, the research activity concerns:

- Study of the synthesis conditions, formation and thermodynamic stability and crystal structure of rare-earth and alkaline-earth inorganic and intermetallic compounds; investigation of possible existing relationships between their crystal chemistry and the resulting physical properties.
- Study of the phase equilibria in the determination of phase diagrams of binary and ternary intermetallic systems of alkaline-earths, lanthanides and actinides.
- Investigation of the physical properties of the new phases and compounds identified, up to the study, in collaboration, of their magnetic structure(s). Then, evaluation of the more outstanding properties found in a material, to check for its potential usability towards an aimed technological application.

#### **Hands-on experiences:**

*Synthesis, melting and quenching techniques*

1. Experience in the synthesis and characterization of materials difficult to prepare [containing volatile metals (Li, K, Mg, Ca, Sr, Ba, Zn, Cd, Hg, Eu, Yb), and/or toxic elements (Be, P, As, Se, Te) or refractory metals/elements (Zr, Hf, Nb, Ta, W, B, C)]; being these materials interesting either in the fundamental and basic research or as functional materials for practical applications [e.: MgB<sub>2</sub>, R-Mg, YbAl<sub>3</sub>C<sub>3</sub>, SmZn, V<sub>3</sub>Si, RNi<sub>2</sub>B<sub>2</sub>C, Be-B-C, Li-B, Fe(Se,Te), R(Fe,T)<sub>2</sub>(As,X)<sub>2</sub> (X = p-block element), R(Fe,T)AsO(F) (T = transition metal), Ti-Hg (Hg dispenser in fluorescent lamps), R-doped (Ti,Zr)Fe<sub>2</sub> getters, Ta and Nb intermetallics, etc.].

2. High-frequency induction melting of samples on a water-cooled copper hearth (Ar, or vacuum), or of samples sealed in Ta, Mo, or Nb crucibles under Ar. Electric arc melting under Ar. Solid-liquid/vapor and solid-solid reactions, in metal/ceramic crucibles sealed in pyrex or silica tubes under vacuum/Ar. Single crystal growth in molten fluxes. Sintering of powders.

#### *Micrographic analysis*

Preparation of micrographic specimens and their checking by optical and scanning electron microscopy (LOM and SEM) and by electron probe microanalysis EPMA (by using self-prepared stoichiometric standard compounds). Evaluation and interpretation of these morphological, microstructural and microanalysis data, to possibly correlate the effects that the synthesis route, solidification and thermal-treatment processes have on the resulting physical properties.

#### *Thermal analysis*

Main thermal analysis techniques: differential thermal analysis (DTA), thermogravimetric (TGA) and differential scanning calorimetry (DSC). The use thermo-analytical data in the study of phase stability, choice of proper annealing treatment and/or quenching techniques, in the phase diagrams determination.

#### *X-ray diffraction*

Use of X-ray diffraction (XRD) from single crystal, powders, bulk and films. Indexing of X-ray powder patterns of multiphase polycrystalline samples in the determination of crystal structures.

#### *Measurements of physical properties*

Heat capacity.

Magnetic susceptibility, isothermal magnetization, magnetocaloric properties.

Electrical resistivity, magnetoresistivity, thermoelectric properties.

#### *Forecast of the properties by crystallochemical considerations and aid of theoretical calculations*

Discussion of experimental results with theoreticians to suggest and

request calculations addressed to forecast the possible existence of a given compound, explain trends in the formation and stability of phases and forecast their magnetic and physical properties.

## Patents

### **Synthesis process for preparing magnesium diboride (MgB<sub>2</sub>) in bulk form**

Inventors: V.Braccini, P. Manfrinetti, A. Palenzona

International Application Number: PCT/IB02/05158 (file ref. PC404PR) 2002.

## *Other professional activities*

### **Scientific Collaborations**

A number of scientific collaborative works are carried out with several national and international researchers. In this context, the main, but not the only, support given to these research collaborations is to synthesize and characterize new materials to be furnished to these scientists for further investigations.

Some of the strongest and long-lasting collaborations are with the following scientists:

- @ Prof. Carlo Ferdeghini  
Institute SPIN (Italian CNR) (Corso Perrone, Genova, Italy)
- @ Prof. Marina Putti  
Department of Physics (University of Genova, Italy).
- @ Prof. Vitalij K. Pecharsky (and late Prof. Karl Gschneidner, Jr.)  
Ames Laboratory, U.S. Department of Energy, and Department of Materials Science and Engineering, Iowa State University, Ames, IA, USA.
- @ Prof. Anja-Verena Mudring  
Department of Materials and Environmental Chemistry, Stockholm University, Stockholm, Sweden.
- @ Prof. Sudesh K. Dhar  
Department of Condensed Matter Physics & Material Science, T.I.F.R., Mumbai, India.
- @ Prof. Clemens Ritter  
Institut Laue-Langevin, ILL, BP 156, 38042 Grenoble, France.
- @ Prof. Olivier Isnard  
Institut Néel, CNRS, Grenoble, France.
- @ Prof. Mahmud Khan  
Department of Physics, Miami University, Oxford, Ohio, USA.
- @ Prof. Alberto Oleaga  
D.pto Física Aplicada I, Escuela de Ingeniería de Bilbao, Universidad del País Vasco, Bilbao, Spain.
- @ Prof. Ernst Bauer  
Institute of Solid State Physics, Vienna University of Technology, Wien, Austria.
- @ Prof. Pierre Godart  
CEA Saclay, Gif-sur-Yvette, Paris, France.
- @ Prof. Yuji Aoki Department of Physics, Tokyo Metropolitan University, Minami-Ohsawa 1-1,

Hachioji-Shi, Tokyo 192-0397. Japan.

@ Prof. Manish K. Kashyap

Department of Physics, Kurukshetra University, Kurukshetra 136119, India.

@ Prof. Massimiliano Galeazzi

Department of Physics, University of Miami, 1320 Campo Sano, Coral Gables, Florida, USA.

@ Prof. Vasil I. Dybkov

Institute for Problems of Material Science, National Academy of Science, Kiev, Ukraine

@ Dr. Adroja Devashibhai

I.S.I.S., Rutherford Appleton Laboratory, Harwell Oxford, England (UK).

#### **Collaborations with private companies**

Technical support has been and is given to private companies, active in the field of the energy applications, by the synthesis and investigation, processing and developing of functional materials (under confidential “non-disclosure” agreement):

- COLUMBUS Superconductors
- ANSALDO Fuel Cells
- SAES Getters
- MARCONI Communications
- EDISON Energy

#### **Referee activity for the following scientific journals**

- Inorganic Chemistry
- Crystal Growth & Design
- Nature Communication
- Journal of Solid State Chemistry
- Journal of Alloys and Compounds
- Intermetallics
- Superconductor Science and Technology
- Journal of Physics: Condensed Matter
- Journal of Magnetism and Magnetic Materials
- Physica Status Solidi B

#### **Conferences organizer**

Member of the Organizing Committee of national and international conferences.