

## Curriculum Vitae di Riccardo Chirone

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Riccardo Chirone is the director of the Institute for Research on Combustion (IRC) del CNR. He earned a MS degree cum laude in Chemical Engineering from Engineering Faculty of the University of Naples Federico II in 1981 and a PhD in Chemical Engineering from the same Faculty in 1986. Riccardo Chirone began his career with the National Research Council as Researcher of the Institute of Research on Combustion of Naples in 1985, and then moved to holding position of increased responsibility, Senior Researcher of the Institute in 1996 and Head of Research since December 2001.

In 1985 he has been Visiting Engineer at the Department of Chemical Engineering of MIT, Cambridge, Massachusetts, USA where he performed research on the behavior of solid carbon particles during fluidized bed combustion in the staff of proff. A. Sarofim e J. Beer. Riccardo Chirone has developed an intense research activity acquiring technical and scientific skills and attitudes of operating strategy that have been frequently measured by taking responsibility for coordination and direction of working groups, and projects: member of the Scientific Council of the Department for Energy and Transport of the CNR (2009-2012), member of the Board of the Institute for Research on Combustion (1988-2008), member of the Coordination Group of the Technology Platform for Sustainable Management of Wastes of the Ministry of Education and Internationalization (2011), member of the Scientific Board of the "Smart Power System District" of the Campania Region (2012 up today), member of the CNR Commission of Experts for the evaluation of Cooperation Proposals in the framework of agreements with foreign counterparts Bodies (2011 e 2012), expert designated by CNR in Commission for Environmental Impact Assessment of the Ministry of the Environment (2005), member of the Coordination Group of the project "Advanced technologies for the integration of the electric production systems" of the Campania Regional Competence Centre on "New Technologies for Production Activities" (2006-2005). He has operated in several positions of responsibility in national and international research projects, including the coordination of projects of the Research Fund for Coal and Steel of the European Union and the coordination of a cluster of CNR Institutes for a PON project. Chirone has been the Chairman of several International Conferences of Fluidization Technologies, Combustion Symposia and Workshops on "Solid Fuels, Waste Combustion and Gasification" and "Attrition Phenomena in Fluidized Bed Combustors".

Riccardo Chirone is an active researcher in the field of chemical reactors, combustion and gasification processes and process technology of granular solids. Author of about 130 international publications in ISI Journals (about 1870 citations, h-index = 26 @ 10.02.2016 – source Scopus), over 300 publications in Conference proceedings with international and national Peer Review Committee and 4 patents.

The research interests of dr. Chirone are related to three main areas:

- ✓ *Fluidized bed reactors for the clean combustion and gasification of solid fuels,*
- ✓ *Sound assisted fluidization of cohesive powders particles*
- ✓ *Combustion and gasification mechanisms and kinetics of coals and other carbonaceous materials.*

The national and international visibility of Riccardo Chirone is provided by different scientific awards:

- Best Poster Award at the 1<sup>st</sup> International Congress "Advances in the Packaging Industry Product and Process, Naples Italy 19-20 Novembre (2015)
- Oscar Masi 2013 Award – 30 edition, to the Team of Tekne Fluff project (2014)
- Key-note lecture - Conf. Int. Fluidization XIV, Noordwijkerhout, Netherlands (2013)
- Best Paper Award: *An Assessment of Water and Steam Reactivation of a Fluidized Bed Spent Sorbent for Enhanced SO<sub>2</sub> Capture*, 6th Int. Symposium and Exhibition of Gas Cleaning at High Temperatures, Osaka, Japan (2005)
- Chairman of the 21<sup>st</sup> Int. Conference on Fluidized Bed Combustion, Italy (2012)

- Chairman of the 12th Int. Conference Multiphase Flow in Industrial Plants, Italy (2011)
- Chairman of the Colloquium: Solid Fuels, Waste Combustion and Gasification, del Sixth (2009) and of the Seventh Mediterranean Combustion Symposium, (2011)
- Chairman of the Workshop: Combustion Technologies for the Optimization of Production/Consumption Cycles, Italian Section of the Combustion Institute, Italy (2005)
- Chairman of Fluidization XI – Present and Future for Fluidization Engineering, Engineering Conference International, NY, USA, Italy (2004)
- Chairman of the Colloquium: Solid fuels and waste combustion, Third Mediterranean Combustion Symposium, Marrakech, Morocco, (2003)
- Chairman of the Workshop: Attrition Phenomena in Fluidized Bed Combustion of Fossil/non-Fossil Fuels, 41<sup>st</sup> IEA-Fluidized Bed Conversion Meeting, Italy (2000)
- Plenary Lecture on Particle Comminution Phenomena in the Fluidized Bed Combustion of non-Fossil Fuels, Mediterranean Combustion Symposium '99: Turchia, (1999).
- Chairman of the Colloquium: Solid Fuels, *XXVI Symposium (Int.) on Combustion*, Italy 1996
- Reviewer of several national and International research projects (INTAS – Int. Association for the Promotion of Cooperation with Scientists from the New Independent States; MIUR; CIVR; PRRIITT etc.)
- Member of reviewers' panel of international journals relevant to the fields of Chemical Engineering, of Combustion and of Powder Technology: Chem. Eng. Sci., Powder Technol., Combust. Sci. Technol., Combust. Flame, Prog. Energy Comb. Sci., AIChE J., of the Biennial Symposia on Combustion, of the Fluidization Conferences organized by the Engineering Foundation and of the Biennial Fluidized Bed Combustion Conferences organized by ASME

Selected Publications in ISI Journals in the last five years:

2016

Viscusi A., P. Ammendola, A. Astarita, F. Raganati, F. Scherillo, A. Squillace, R. Chirone, L. Carrino

Aluminum foam made via a new method based on cold gas dynamic sprayed powders mixed through sound assisted fluidization technique, *Journal of Materials Processing Technology*, Vol. 231, pp. 265–276.

Arepraserta C., F. Scala, A. Coppola, M. Urciuolo, R. Chirone, P. Chanyavanich, K. Yoshikawa  
Fluidized bed co-combustion of hydrothermally treated paper sludge with two coals of different rank, *Fuel Processing Technology*, Vol. 144, pp. 230–238.

Gargiulo V., M. Alfèa, P. Ammendola, F. Raganati, R. Chirone  
CO<sub>2</sub> sorption on surface-modified carbonaceous support: Probing the influence of the carbon black microporosity and surface polarity, *Applied Surface Science*, Vol. 360, Part A, pp. 329–337.

2015

Raganati F., P. Ammendola, R. Chirone  
Effect of acoustic field on CO<sub>2</sub> desorption in a fluidized bed of fine activated carbon, *Particology*, Vol. 23, pp. 8–15.

Raganati F., P. Ammendola, R. Chirone  
CO<sub>2</sub> Capture by Adsorption on Fine Activated Carbon in a Sound Assisted Fluidized Bed, *Chemical Engineering Transactions*, Vol. 43, pp. 1033-1038.

Ruoppolo G., Miccio F., Brachi P., Picarelli A., Chirone R.  
In situ carbon dioxide capture during biomass fluidized bed gasification, *Chemical Engineering Transactions*, Vol 43, pp. 775-780.

Rubino F., P. Ammendola, A. Astarita, F. Raganati, A. Squillace, A. Viscusi, R. Chirone, L. Carrino

An innovative method to produce metal foam using cold gas dynamic spray process assisted by fluidized bed mixing of precursors, *Key Engineering Materials*, Vol. 651.653, pp. 913-918

Gargiulo V., Raganati F., Ammendola P., Alfe M., Chirone, R.  
HKUST-1 metal organic framework as CO<sub>2</sub> adsorbent in a sound assisted fluidized bed, *Chemical Engineering Transactions*, Vol 43, pp. 1087-1092.

Ammendola P., Raganati F., Chirone R.  
Effect of operating conditions on the CO<sub>2</sub> recovery from a fine activated carbon by means of TSA in a fluidized bed assisted by acoustic fields, *Fuel Processing Technology*, Vol. 134, pp. 494–501.

Alfe M., Ammendola P., Gargiulo V., Raganati F., Chirone, R.  
Assessment of magnetite/carbon composites capacity in CO<sub>2</sub> adsorption under sound assisted fluidization conditions, *Chemical Engineering Transactions*, Vol 43, pp. 1081-1086.

Salatino P., Ammendola P., Bareschino P., Chirone R., Solimene R.  
Improving the thermal performance of fluidized beds for concentrated solar power and thermal energy storage, *Powder Technology*, Vol. 290, pp. 97–101.

Alfe M., Ammendola P., Gargiulo V., Raganati F., Chirone R.  
Magnetite loaded carbon fine particles as low-cost CO<sub>2</sub> adsorbent in a sound assisted fluidized bed, *Proceedings of the Combustion Institute*, Vol. 35, Issue 3, pp. 2801-2809.

2014

Salemme, L., Simeone, M., Chirone, R., Salatino, P.  
Analysis of the energy efficiency of solar aided biomass gasification for pure hydrogen production *International Journal of Hydrogen Energy*, 39, pp. 14623-14632.

Raganati, F., Ammendola, P., Chirone, R.  
CO<sub>2</sub> capture performances of fine solid sorbents in a sound-assisted fluidized bed *Powder Technology*, 268, pp. 347-356.

Brachi, P., Chirone, R., Miccio, F., Miccio, M., Picarelli, A., Ruoppolo, G.  
Fluidized bed co-gasification of biomass and polymeric wastes for a flexible end-use of the syngas: Focus on bio-methanol *Fuel*, 128, pp. 88-98.

Alfe, M., Ammendola, P., Gargiulo, V., Raganati, F., Chirone, R.  
Magnetite loaded carbon fine particles as low-cost CO<sub>2</sub> adsorbent in a sound assisted fluidized bed *Proceedings of the Combustion Institute*, Article in Press.

Raganati, F., Gargiulo, V., Ammendola, P., Alfe, M., Chirone, R.  
CO<sub>2</sub> capture performance of HKUST-1 in a sound assisted fluidized bed *Chemical Engineering Journal*, 239, pp. 75-86.

Solimene, R., Fenelli, P., Chirone, R., Salatino, P.  
Heat transfer phenomena in bubbling fluidized beds for concentrated solar power CFB-11: *Proceedings of the 11th International Conference on Fluidized Bed Technology*, pp. 435-440.

Raganati, F., Ammendola, P., Chirone, R.  
CO<sub>2</sub> adsorption on fine activated carbon in a sound assisted fluidized bed: Effect of sound intensity and frequency, CO<sub>2</sub> partial pressure and fluidization velocity *Applied Energy*, 113, pp. 1269-1282.

Bareschino, P., Solimene, R., Chirone, R., Salatino, P.

Gas and solid flow patterns in the loop-seal of a circulating fluidized bed  
Powder Technology, 264, pp. 197-202.

2013

Valverde, J.M., Raganati, F., Quintanilla, M.A.S., Ebri, J.M.P., Ammendola, P., Chirone, R.  
Enhancement of CO<sub>2</sub> capture at Ca-looping conditions by high-intensity acoustic fields  
Applied Energy, 111, pp. 538-549.

Angrisani, G., Bizon, K., Chirone, R., Continillo, G., Fusco, G., Lombardi, S., Marra, F.S., Miccio, F., Roselli, C., Sasso, M., Solimene, R., Tariello, F., Urciuolo, M.  
Development of a new concept solar-biomass cogeneration system  
Energy Conversion and Management, 75, pp. 552-560.

Ruoppolo, G., Miccio, F., Brachi, P., Picarelli, A., Chirone, R.  
Fluidized bed gasification of biomass and biomass/coal pellets in oxygen and steam atmosphere  
Chemical Engineering Transactions, 32, pp. 595-600.

Apra, G., Cammarota, A., Chirone, R., Solimene, R., Salatino, P.  
Hydrodynamic characterization of the biomass combustion in a pilot scale fluidized bed combustor  
Chemical Engineering Transactions, 32, pp. 1519-1524.

Cammarota, A., Chirone, R., Salatino, P., Solimene, R., Urciuolo, M.  
Particulate and gaseous emissions during fluidized bed combustion of semi-dried sewage sludge:  
Effect of bed ash accumulation on NO<sub>x</sub> formation  
Waste Management, 33 (6), pp. 1397-1402.

Senneca, O., Urciuolo, M., Chirone, R.  
A semidetalled model of primary fragmentation of coal  
Fuel, 104, pp. 253-261.

Ammendola, P., Chirone, R., Ruoppolo, G., Scala, F.  
The effect of pelletization on the attrition of wood under fluidized bed combustion and gasification conditions  
Proceedings of the Combustion Institute, 34 (2), pp. 2735-2740.

Scala, F., Chirone, R., Meloni, P., Carcangiu, G., Manca, M., Mulas, G., Mulas, A.  
Fluidized bed desulfurization using lime obtained after slow calcination of limestone particles  
Fuel, 114, pp. 99-105.

2012

Urciuolo, M., Solimene, R., Chirone, R., Salatino, P.  
Fluidized bed combustion and fragmentation of wet sewage sludge  
Experimental Thermal and Fluid Science, 43, pp. 97-104.

Salatino, P., Di Benedetto, A., Chirone, R., Salzano, E., Sanchirico, R.  
Analysis of an explosion in a wool-processing plant  
Industrial and Engineering Chemistry Research, 51 (22), pp. 7713-7718.

Ruoppolo, G., Ammendola, P., Chirone, R., Miccio, F.  
H<sub>2</sub>-rich syngas production by fluidized bed gasification of biomass and plastic fuel  
Waste Management, 32 (4), pp. 724-732.

Ammendola, P., Cammisa, E., Chirone, R., Lisi, L., Ruoppolo, G.  
Effect of sulphur on the performance of Rh-LaCoO<sub>3</sub> based catalyst for tar conversion to syngas  
Applied Catalysis B: Environmental, 113-114, pp. 11-18.

Solimene, R., Chirone, R., Salatino, P.

Characterization of the devolatilization rate of solid fuels in fluidized beds by time-resolved pressure measurements

AICHE Journal, 58 (2), pp. 632-645.