



JUAN A. GALLEGO-JUÁREZ  
Biographical Sketch

### Academic Degrees

Doctor Honoris Causa, University of Santiago de Chile, 2004  
Doctor Physical Sciences, University of Madrid, 1971  
Doctor Physics, University of Rome, Italy, 1970  
Master Physical Sciences, University of Madrid, June 1966

### Positions Held

2011- Principal Scientific Adviser, PUSONICS, S.L.  
1988- Research Professor, CSIC  
1991-2003: Director, Institute of Acoustics CSIC  
1994-2002: Director, Center for Physical Technologies, CSIC  
1971-1995: Head, Ultrasonics Laboratory of the Institute of Acoustics, CSIC  
1973-1988: Scientific Researcher, CSIC  
1971-1972: Scientific Collaborator, CSIC  
1969-1970: Scientific Collaborator, CNR  
1966-1970: Postgraduate Fellow, CSIC and CNR  
1965-1966: Graduate Fellow, CSIC

*CSIC: Higher Council for Scientific Research of Spain*

*CNR: National Research Council of Italy*

### Other Professional Activities

- President of the 19th International Congress on Acoustics (ICA2007 MADRID)
- Member of the Boards:
  - International Commission for Acoustics (1998-2007)
  - World Congress on Ultrasound (1993-2006)
  - International Congress on Ultrasonics ( 2006-2011 )
  - Spanish Acoustical Society (1991-)
- Member of Editorial Boards
  - Ultrasonics (1979-2002)
  - Acustica/ Acta Acustica (1993-2011)
- Fellow
  - Acoustical Society of America
  - British Institute of Acoustics
- Member
  - New York Academy of Sciences
  - IEEE
  - Ultrasonic Industry Association
- Chairman of the Technical Committee on Ultrasound of the European Acoustical Association (2002-2007)

## Awards

- Distinguished Service Award (Golden Whistle Award), International Congress on Ultrasonics, 2011
- Member of Merit, Spanish Acoustical Society, 2011
- Gold Medal, University of Santiago de Chile, 2004
- Honor Diploma, Portuguese Acoustical Society, 2004
- First Prize to Technological Innovation, Babcock Foundation, 1995
- First Prize to Scientific Research, (Ph.D. Thesis), Saving Bank of Cordoba, 1971

## Contribution to Ultrasonics

His research work has always been related to ultrasonics, particularly high-power ultrasonics, transducers and applications. He is the author of more than 200 publications and holds 38 patents.

His major contribution to Acoustics is in the field of **High-Power Ultrasound** and more especially in the study, design, development and characterization of **new power sonic and ultrasonic generators**, in their application to the production of **macrosonic processes** and in the study of the corresponding **nonlinear phenomena** involved in such processes.

The first achievement to be pointed out is the invention and development of a **new type of power sonic and ultrasonic transducer for use in gases and multiphase media** (gas-liquid, gas-solid): the stepped-plate transducer. This transducer mainly consists of a large plate radiator of stepped profile which is driven by a piezoelectric or magnetostrictive vibrator. The stepped plate radiator is vibrating in one of its flexural modes and is tuned with a piezoelectric extensional vibrator. The new transducers are characterized by the efficient generation of high-directional (coherent) and/or focusing radiation.

Among the several **macrosonic applications** he has studied and developed, the following have to be mentioned: aerosol agglomeration, defoaming, dehydration, textile washing, debubbling and supercritical fluids extraction assisted by ultrasound.

The application of sonic and ultrasonic energy for **particle agglomeration and precipitation** is to be applied in problems such as cleaning of smoke, powder precipitation in mines, precipitation of toxic clouds, safety of nuclear reactors, etc.

**Ultrasonic defoaming** is basically pointed towards food and beverage industries where chemical anti-foam agents may adversely affect the product. Several systems have been developed and successfully applied in various industrial problems.

**Dehydration** is a process in which the liquid is removed from a product without changing its phase. By using high power ultrasound a process is developed to release moisture. Such a process has been applied for food drying as well as for post filtration dewatering of sludges.

**Washing of textiles** by using ultrasound is a process which offers more problems than cleaning of rigid materials. Nevertheless, a new ultrasonic washing process has been implemented based on the production of cavitation in a thin layer of liquid. A pilot ultrasonic washing machine working in continuous has been developed. This process is useful in textile manufacture and other industrial applications.

**Debubbling** is other important technological tasks in which he was involved in the research and development of the application of ultrasonic energy for superficial homogenisation of industrial coating.

The application of **ultrasonic energy to accelerate supercritical fluid extraction processes** represents a new way to improve a technique which is emergent in food industry.

The majority of these new ultrasonic processes have been patented and to exploit such an important potential, Prof. Gallego-Juárez promoted in 2008 the creation of the spin-off company [PUSONICS, S.L.](#)

In the investigation of **nonlinear phenomena** his contribution can be summarized in the following studies: propagation of finite amplitude (spherical and plane) ultrasonic waves in air, finite amplitude longitudinal and flexural standing waves at ultrasonic frequencies in metallic bars, nonlinear effects in multiphase media and transient (inertial) cavitation in gassy liquids. Among the various achievements the following are to be mentioned: experimental study of all the propagation regions of finite-amplitude waves and verification at ultrasonic frequencies of some theoretical models (weak shock theory for spherical waves and Rudnick model for plane waves); development of theoretical models for finite-amplitude standing waves and experimental verification; development of a method for the determination of the nonlinearity parameter of solid materials; development procedure to determine the ultrasonic fatigue limit of metallic materials, development of a semi-empirical model for acoustic agglomeration of aerosol particles; and finally the detection of two different types of transient cavitation in a gassy liquid and the establishment of a new method to detect the inception of transient (inertial) cavitation.

## MAIN RECENT PUBLICATIONS

### JOURNALS

1. J. A. Gallego-Juárez, G. Rodríguez, Víctor Acosta, E. Riera  
“Power ultrasonic transducers with extensive radiators for industrial processing”,  
Ultrasonic Sonochemistry, 17 (6),( 2010), pp 953-964
2. J. A. Gallego-Juárez, E. Riera, V. M. Acosta, G. Rodríguez, A. Pinto, A. Blanco  
“Ultrasonic system for continuous washing of textiles in liquid layers”  
Ultrasonics Sonochemistry 17 (2010), pp.234-238.
3. E. Riera, A. Blanco, J. García, J. Benedito, A. Mulet, J.A. Gallego-Juárez, M. Blasco  
High-power ultrasonic system for the enhancement of mass transfer in supercritical  
CO<sub>2</sub> extraction processes  
Ultrasonics 50 (2010), pp 306-309.
4. J. A. Gallego-Juárez, E. Riera, S. de la Fuente-Blanco, G. Rodriguez-Corral, V. M.  
Acosta-Aparicio, A. Blanco-Blanco  
“Application of high power ultrasound for dehydration of vegetables: processes and  
devices”  
Drying Technology, 25, 2007, pp. 1893-1901.
5. C. Campos- Pozuelo, C. Vanhille, J.A. Gallego- Juárez

- “Comparative Study of the Nonlinear Behavior of Fatigued and Intact Samples of Metallic Alloys”  
IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, January 2006, Vol.53, nº1 (ISSN 0885-3010), pp 175-184
6. E. Riera, J. A. Gallego-Juárez, T. J. Mason  
“Airborne ultrasound for the precipitation of smokes and powders and the destruction of foams”  
Ultrasonics Sonochemistry 13 (2006) pp.107-116
  7. D. Chacón, G. Rodríguez-Corral, L. Gaete-Garretón, E. Riera-Franco de Sarabia, J. A. Gallego-Juárez  
“A procedure for the efficient selection of piezoelectric ceramics constituting stacks in high-power ultrasonic sandwich transducers”  
Ultrasonics 44 c.( 2006) S 1, pp e517-e521
  8. S. de la Fuente-Blanco, E. Riera-Franco de Sarabia, G. Rodríguez-Corral, J. A. Gallego-Juárez  
“Ultrasonic system for drying process”  
Ultrasonics 44, (2006), S 1, pp e523-e527
  9. I. Gonzalez-Gomez, J. Rodriguez, I. Garmendia, J. A. Gallego-Juárez  
“Application of high-intensity air-borne ultrasound for debubbling liquid films”  
Ultrasonics 44.( 2006) S 1, pp e529-e532
  10. E. Riera, Y. Golás, A. Blanco, J. A. Gallego, M. Blasco, A. Mulet.  
“Mass transfer enhancement in supercritical fluids extraction by means of power ultrasound.”  
Ultrasonics Sonochemistry, 11 ( 2004) pp. 241-242
  11. I-Gonzalez-Gomez, J.A Gallego-Juarez  
"Contribution of the acoustic wake effect to the attenuation of sound on dilute suspensions of rigid particles"  
IEEE Transactions on Ultrasonics, Ferroelectrics and Frequency Control, , Vol 50, nº3,(2003) pp 334-338.
  12. J. A. Gallego-Juárez, L. Elvira-Segura G. Rodríguez-Corral,  
“A power ultrasonic technology for deliquoring”  
Ultrasonics, Vol. 41 (2003) p. 255-259
  13. I. Gonzalez, J. A. Gallego Juárez, E. Riera  
“The influence of entrainment on acoustically induced interactions between aerosol particles- an experimental study”.  
Aerosol Science 34, (2003), pp. 1611-1631.
  14. A. Iula, F. Vazquez, M. Pappalardo, and J. A. Gallego  
“Finite element three dimensional analysis of the vibrational behaviour of the Langevin-type transducer”  
Ultrasonics, Vol 40 (2002) pp.513-517
  15. J. A. Gallego-Juárez, G. Rodríguez-Corral, E. Riera-Franco de Sarabia, F. Vázquez-Martínez, C. Campos-Pozuelo, V. M. Acosta-Aparicio.

- “Recent developments in vibrating-plate macrosonic transducers”  
Ultrasonics, Vol 40 (2002) pp. 889-893
16. I. Gonzalez-Gómez, L. Elvira-Segura, T. Hoffmann, J. A. Gallego-Juarez  
“Numerical Study of the Hydrodynamic Interaction between Aerosol Particles due to the Acoustic Wake Effect”  
Acustica/Acta Acustica, Vol 87 n°4, (2001), pp. 437-530
  17. L. Elvira, G. Rodríguez, J. A. Gallego-Juárez  
"Ultrasonic assisted deliquoring of fine particle slurries"  
Acustica/Acta Acustica , Vol. 86 (2000), pp 179-180.
  18. I. Gonzalez, T.L. Hoffmann, J.A. Gallego-Juárez  
"Theory and calculation of sound induced particle interactions of viscous origin"  
Acustica/Acta Acustica Vol. 86, n° 5 (2000), pp 784-797
  19. J. A. Gallego- Juárez, G. Rodríguez- Corral, E. Riera, C. Campos- Pozuelo, F. Vázquez- Martínez, V. Acosta- Aparicio  
"A macrosonic system for industrial processing"  
Ultrasonics Vol. 38 (2000), PP331-336
  20. E. Riera, J. A. Gallego- Juárez, G. Rodríguez- Corral, L. Elvira- Segura, I. González- Gómez.  
"Application of high-power ultrasound to enhance fluid/solid particles separation processes"  
Ultrasonics Vol. 38 (2000), PP 642-646.
  21. E. Riera, J. A. Gallego- Juárez, G. Rodríguez- Corral, V. Acosta- Aparicio, J. J. Rodríguez- Maroto, J. L. Dorrónosoro, D. Sanz-Rivera, F. J. Gómez-Moreno y M. Martín Espigares  
"Acoustic agglomeration of submicron particles in diesel exhausts: first results of the influence of humidity at two acoustic frequencies"  
J. Aerosol Sci. Vol. 31 S1, (2000), pp.S827-S828
  22. I. Gonzalez, T.L. Hoffmann, J.A. Gallego- Juárez  
“Precise measurement of particle acoustic entrainment between 20 and 3500 Hz”  
Journal of Aerosol Science, Vol. 31, n° 12,(2000) pp. 1461-1468

## BOOK CHAPTERS

1. J.A. Gallego-Juárez  
“Power Ultrasonics: New Technologies and Applications for Fluid Processing”  
Chapter in “Ultrasonic Transducers: Materials and Design for Sensors, Actuators and Medical Applications”, K.Nakamura (Ed), Woodhead Publishing Limited, Cambridge (UK).  
(in press)
2. J .A. Gallego-Juárez  
“Application of Ultrasonic Energy for Washing Textiles” Chapter 20 in "Textiles: Types, Uses and Production Methods", Ahmed El Nemr(Ed), Nova Science Publishers, Inc. New York (USA).

3. E. Riera, J.V. García-Perez, J.A. Carcel, V. M. Acosta and J.A. Gallego-Juárez  
“A Computational Study of Ultrasound Assisted Drying of Food Materials” Chapter 13 in “Innovative Food Processing Technologies: Advances in Multiphysics Simulation” K. Knoerzer, P. Juliano, P. Roupas and C. Versteeg (Eds)., 2011, John Wiley & Sons, Ltd, , Oxford,,UK pp265-301
4. J. A Gallego-Juárez and E. Riera  
“Technologies and Applications of Air-Borne Power Ultrasound in Food Processing” Chapter 25 in “Ultrasound Technologies for Food and Bioprocessing” pp 617-642, H. Feng, G.V. Barbosa and J. Weiss (Eds), Springer, New York 2011
5. J.A. Gallego-Juárez, E. Riera, V. M. Acosta-Aparicio  
“Modal Interactions in High-Power Ultrasonic Processing Transducers”, Chapter in “Nonlinear Acoustics Fundamentals and Applications” B.O Enflo; C.M.Hedberg, L. Kari (Eds), AIP New York. 2008 pp 595-604.
6. Campos-Pozuelo, C. Vanhille and J.A. Gallego-Juárez  
Nonlinear Elastic Behaviour and Ultrasonic Fatigue of Metals” Chapter 28 in "The Universality of Nonclassical Nonlinearity, with Applications to NDE and Ultrasonics", P.P. Delsanto( Ed)., Springer, NewYork 2006,
7. J.A. Gallego-Juarez  
"Nonlinear Acoustics and Industrial Applications" Chapter in “Nonlinear Acoustics at the Turn of the Millenium”,. W. Lauterborn, T. Kurz ( Eds), AIP, New York, 2000, pp. 45-54

#### **INVITED LECTURES AT INTERNATIONAL CONFERENCES**

1. 40th Annual Symposium of Ultrasonics Industrial Association, Glasgow, University of Glasgow (UK), 23-25 May 2011  
“Power industrial ultrasonics in fluid and multiphase media: processes and technologies”  
Juan A. Gallego-Juárez  
Keynote lecture
2. Argonne National Laboratory, USA. 13-15 April 2011  
“Power ultrasound and its various applications in airborne processes”  
Juan A. Gallego-Juárez  
Invited lecture
3. International Congress on Ultrasound, 11-17 January 2009, Santiago de Chile  
“High-power ultrasonic processing: recent developments and prospective advances”  
J. A. Gallego-Juárez  
Plenary Lecture
4. WSEAS Internacional Conference-AMTA 09- Prague March 2009  
“Macrosomics: Sound as a Source of Energy”  
J. A. Gallego-Juárez  
Plenary Lecture



5. 18th ISNA, Stockholm 7-10 July 2008  
“Modal interactions in high-power ultrasonic processing transducers”,  
J.A. Gallego-Juárez, E. Riera, V. M. Acosta-Aparicio  
Keynote lecture
6. 19<sup>th</sup> International Congress on Acoustics, 2-7 September 2007, Madrid.  
“Acoustics for the 21<sup>st</sup> Century”  
J.A. Gallego-Juárez  
Opening Plenary Lecture
7. 19<sup>th</sup> International Congress on Acoustics, 2-7 September 2007, Madrid.  
“Industrial requirements in high-power ultrasonic transducers for defoaming”  
G. Rodriguez, V. M..Acosta, A. Pinto, J. A. Gallego-Juárez  
Invited lecture
8. 19<sup>th</sup> International Congress on Acoustics, 2-7 September 2007, Madrid.  
“Prototype for the use of ultrasound in supercritical media”  
E. Riera, A. Blanco, V.M. Acosta, J.A. Gallego-Juárez, M. Blasco, A. Mulet.  
Invited lecture
9. 19<sup>th</sup> International Congress on Acoustics, 2-7 September 2007, Madrid.  
“Non linear down-frequency conversion effects in high intensity vibration of plate transducers and piezoelectric structures”  
Adriano Alippi, Andrea Bettucci, Angelo Biagioni, J. A. Gallego-Juárez,. Daniele Passeri, E. Riera’  
Invited lecture
10. 9<sup>th</sup> Meeting of the European Society of Sonochemistry, Badajoz, 25-30 April 2004  
“High-Power Ultrasonic Technologies for Food Processing”  
J. A. Gallego-Juárez  
Invited Lecture
11. Workshop on Ultrasound for textile applications, Povia de Varzim, Portugal, 11-12 Nov. 2004.  
“Interaction of high-intensity ultrasound with textile materials in water media”  
J. A. Gallego-Juárez  
Invited Lecture
12. Congrès Français d’Acoustique, Lille, April 2002  
"New Industrial Applications of High-power ultrasound"  
J. A. Gallego-Juárez  
Plenary Lecture
13. 1<sup>st</sup> Innovative Foods Centre Conference, 28-29 November 2002, Werribee, Australia  
“Development of high-power ultrasonic technologies for food processing at the Instituto de acústica”  
J. A. Gallego Juárez  
Plenary Lecture

14. Forum Acusticum 2002, Sevilla, 16-20 Sept. 2002  
"Macrosonics: Phenomena, transducers and applications"  
J. A. Gallego Juárez  
Closing Plenary Lecture
15. Forum Acusticum 2002, Sevilla, 16-20 Sept. 2002  
"Application of high-power ultrasound for drying vegetables"  
E. Riera-Franco de Sarabia, J.A. Gallego-Juárez, G. Rodríguez-Corral, V.M. Acosta-Aparicio, E. Andrés-Gallegos  
Invited Lecture
16. Forum Acusticum 2002, Sevilla, 16-20 Sept. 2002  
"Influence of the acoustic entrainment on aerosol particle interactions: experimental balance of the hydrodynamic mechanisms"  
I. Gonzalez Gómez, J. A. Gallego Juárez , E. Riera Franco de Sarabia  
Invited Lecture
17. Forum Acusticum 2002, Sevilla, 16-20 Sept. 2002  
"Analysis of the nonlinear reverberation of titanium alloys fatigued at high amplitude ultrasonic vibration"  
K. Van den Abeele, C. Campos Pozuelo, J. A. Gallego Juárez, F. Windels, B. Bollen  
Invited Lecture
18. IV Jornadas Iberoamericanas, Santiago de Chile, July 2002  
"Aplicaciones industriales de los ultrasonidos de potencia"  
J. A. Gallego, G. Rodríguez  
Invited Lecture
19. World Congress on Ultrasonics/IEEE International Ultrasonic Symposium, Atlanta 6-10 October 2001  
"Development of industrial models of high-power stepped-plate sonic and ultrasonic transducers for use in fluids."  
J. A. Gallego-Juárez, G. Rodríguez-Corral, E. Riera-Franco de Sarabia, F. Vázquez-Martínez, V.M. Acosta-Aparicio, C. Campos-Pozuelo  
Invited Lecture
20. 17th International Congress on Acoustics, Rome 2-7 Sept. 2001  
"The absorption of sound in suspensions due to the acoustic wake effect"  
I. Gonzalez-Gómez, J. A. Gallego-Juárez  
Plenary Lecture
21. Ultrasonics International 2001, 2-5 July 2001, Delft, Holland.  
"A power ultrasonic technology for deliquoring"  
J. A. Gallego-Juárez, L. Elvira-Segura G. Rodríguez-Corral  
Invited Lecture
22. Ultrasonics International 2001, 2-5 July 2001, Delft, Holland  
"Recent developments in vibrating-plate macrosonic transducers"  
J. A. Gallego-Juárez, G. Rodríguez-Corral, E. Riera-Franco de Sarabia, F. Vázquez-Martínez, C. Campos-Pozuelo, V. M. Acosta-Aparicio  
Invited Lecture



23. Ultrasonic Industry Association Symposium, Columbus, Ohio, USA, 11-13 June 2000  
"New power ultrasonic technologies for environmental and industrial applications"  
J. A. Gallego-Juarez  
Plenary Lecture

## RECENT INVITED LECTURES OUT OF CONFERENCES

1. "Remediación de la contaminación atmosférica por partículas finas mediante aglomeración acústica"  
CEMA "Jornada sobre la contaminación aérea por partículas y por malos olores", ,  
Escuela Técnica Superior de Ingenieros de Minas, Universidad Politécnica de Madrid, 20  
Oct. 2011.  
Juan A. Gallego Juárez
2. "Power ultrasound and its various applications in airborne systems"  
Argonne National Laboratory, US Department of Energy, The University of Chicago,  
USA, 14 April 2011.  
J. A. Gallego Juárez
3. "Los ultrasonidos de potencia y sus aplicaciones"  
Facultad de Ciencias Físicas, Universidad Complutense de Madrid.  
Ceremonia de entrega de Premios Extraordinarios de Licenciatura, y Doctorado, 12 Dic.  
2006
4. "Development of high-power ultrasonic technologies for food and pharmaceutical  
processing"  
Laboratories Fresenius-Kabi, Uppsala Sweden, 31 August 2006  
J. A. Gallego-Juárez
5. "High-power stepped-plate ultrasonic transducers for use in fluids and in multiphase  
media"  
Shaanxi Normal University, Xian, China, 26 Sept. 2006.  
J. A. Gallego-Juárez
6. "Development of new high-power ultrasonic processes and applications"  
Shaanxi Normal University, Xian, China, 28 Sept. 2006.  
J. A. Gallego Juárez
7. "Factores de éxito en las tareas de I+D: relación entre investigadores y las grandes  
compañías"  
Ciclo de conferencias en Ciencia y Tecnología para el Desarrollo y la Competitividad en  
la Minería, Santiago de Chile 2-5 Mayo 2006.  
J. A. Gallego Juárez

Madrid, December 2011