Juan A. Conesa--deleted

Subjects: Others

Contributor: Juan Conesa

Juan A. Conesa is Professor of Chemical Engineering at the University of Alicante. During the last 25 years he has been developing his research work on issues related to the thermal decomposition of waste, both in pyrolysis and in combustion. In the year 2000, together with his research group, he pointed out the analytical techniques related to dioxins and furans. Since then the research group works on the analysis and formation and destruction of these compounds in thermal decomposition systems. He is the author of more than 170 scientific articles and has directed around 50 research projects and 12 theses in the field of waste recovery. Since 2015 he is the director of the research group "Waste, Energy, Environment and Nanotechnology (WEEN)" of the University of Alicante.

Combustion technology | Industrial chemistry | Atmospheric pollution control | Industrial wastes | Waste elimination | Pyrolysis | Gasification | Combustion | Dioxins | Pollution | Wastes

Achievements

It is a reality that the production of solid urban waste, although it has been decreasing in the last years, is still a problem, counting in Europe with a production during 2013 of 492 kg / inhabitant / year. The culture of recycling is growing more and more in European society, but landfills continue to receive the greatest burden of this waste, despite the fact that European policy advocates a higher rate of recycling and energy use of the rest fraction (non-recyclable) in incineration furnaces.

Juan A. Conesa has studied in detail the thermal decomposition of many different wastes, carrying out the characterization of the wastes, their thermogravimetric study, the proposal of kinetic models of the decomposition, and the production of pollutants in different conditions. Pollutants are analysed in their studies, from the simplest gases (CO, CO2 mainly), semi-volatiles (PAHs), up to halogenated pollutants such as polychlorobenzenes and polychlorophenols (PCBzs, PCPhs), polychlorinated biphenyls (PCBs), chlorinated dioxins and furans (PCDD/Fs) and brominated (PBDD / Fs). Thus, the effect of the amount of oxygen present, the temperature, the residence time and the presence of various catalysts in the decomposition of the residues has been studied.

The compounds under study are usually not present in the bottom ash of an incinerator (if the combustion has been complete), while they are in fly ash (when condensing on them) and in vapor phase depending on their vapor pressure and the technologies used to retain these pollutants (dry, wet wash, bag filter, electrofilter, etc.).

Among the wastes studied are plastic waste (PE, PP, PVC, polychloroprene), out-of-use tires, sewage sludge, varnishes, polyester and cotton textile waste, electronic and electrical waste (WEEE)… It is in the latter that he has focused his work in recent years, focusing on the production of chlorinated dioxins and furans and also dioxins/furans with a brominated structure (PBDD/Fs).

From his research group, the importance of the nature of the waste (mainly its content in metals and chlorides) in the formation of dangerous compounds in the treatment processes has been revealed. Likewise, the key role of the presence of oxygen in the production of PAHs, dioxins and related compounds is underlined, observing maximum amounts of these pollutants at intermediate levels of oxygen.

Also, the use of different wastes as fuel in the clinker industry has been studied, measuring the emissions of many pollutants (acid gases, PAHs, PCDD/Fs, heavy metals) with different mix of fuels and wastes in the kiln. A good approach was done by using long-term sampling and measuring the brominated emissions as well as chlorinated pollutants.

In the research currently being carried out in his research group, the possible routes of treatment of several types of voluminous waste (mattresses, remains of furniture, vehicles out of use, marine debris) and electronic waste are analysed. The possibility of densification of bulky waste by briquetting is also being studied.

Currently, Juan A. Conesa is working on a project aimed to study processes that minimize the emission of pollutants during the energy recovery of waste, mainly electronic and electrical because they have high contents of halogenated compounds, through pretreatment and/or inhibition processes.

Thiourea and other sulphur compounds were tested for inhibition of PCDD/Fs formation, and also the presence of nitrogen or sulphur rich wastes in the mix is being decomposed. Good results have been obtained by mixing a highly chlorinated waste as PVC with mattresses (nitrogen-rich waste) in small proportions. A reduction close to 98 % of the emission has been observed mixing with only 3 % of mattress.

Also, the pre-treatment of wastes can help to reduce PCDD/Fs and PBDD/Fs emission. The current project achieves effective dehalogenation of WEEE in a high-pressure reactor, with efficiencies of dehalogenation close to 95 % at mild conditions. The dehalogenated wastes present a very low production of pollutants in the subsequent thermal decomposition, improving the effective disposal of the wastes.

The potential applications of the results of this project would be the thermal treatment units (incinerators, blast furnaces, kilns for the production of cement and ceramics) where a reduction of the pollutants produced could be achieved.

PERSONAL INFORMATION

First and Family name	Juan Antonio Conesa Ferrer	
Sex	MALE	
Researcher codes	SCOPUS Author ID	7007052066
	Open Researcher and Contributor ID (ORCID)	0000-0001-7981-440X

Current position

Name of University/Institution	University of Alicante		
Department	Chemical Engineering		
Address and Country	P.O. 99 E-03080 Alicante (Spain)		
Phone number	965903400	E-mail	ja.conesa@ua.es
Current position	Professor of Chemical Engineering	From	07/02/2008
Key words	Combustion technology, Industrial chemistry, Atmospheric pollution control, Industrial wastes, Waste elimination, Pyrolysis, Gasification, Combustion, Dioxins, Pollution, Wastes		

Education

PhD	University	Year
BSc in Chemistry	University of Alicante (Spain)	1992
PhD in Chemical Engineering	University of Alicante (Spain)	1996

JCR articles, h Index, thesis supervised

Number of **PhD theses supervised** in the last 10 years: **10**.

JCR articles: 144. **Total citations: 4845** (Scopus, 6583 Google Scholar). Average number of **citations/year** over the last 5 years (2015-2019): **405** (Scopus, 545 Google Scholar). **H Index: 41** (Scopus, 47 Google Scholar).

CV SUMMARY

- **PhD thesis** “Study of the pyrolysis of polyethylene plastic waste and used tires” in Chemical Engineering, University of Alicante (1996)
- **Postdoctoral stay** at the Hawaii Natural Energy Institute in Honolulu (USA) working on the production of carbonaceous materials (August 1996 – February 1997)
- **Lecturer** in Chemical Engineering, University of Alicante (1994 – 1998)
- **Senior Lecturer** in Chemical Engineering, University of Alicante (1998 – 2008)
- **Professor in Chemical Engineering**, University of Alicante (2008 – now)

Prof. Juan A. Conesa has 4 six-year research periods (“sexenios”) and 5 five-year teaching periods (“quinquenios”). Over the past 25 years he has developed his research on topics related to the decomposition kinetics and degradation processes of wastes under pyrolytic and oxidative conditions, as well as in pollutant analysis from the thermal degradation of wastes (under different conditions of temperature, atmosphere, residence time, etc.).

In the year 2000, together with his research group, he initiated the analysis of dioxins and furans at the University of Alicante. Since then the research group has conducted extensive research on the analysis and formation/destruction of these compounds in thermal decomposition systems. In fact, the group has been recently identified as one of the world's top 10 productive institutions in terms of dioxin-related publications from waste incineration and steel sintering (Environmental Science and Pollution Research, 26:35687–35703, 2019).

He promoted the acquisition of pollution sensors and the initiation of the analysis of pollutants in emission and immission samples (metals, gases, halogenated organic compounds.). Later, he has worked on the decomposition of electrical and electronic residues, with special focus on the formation of brominated contaminants due to the presence of brominated flame retardants. He has also collaborated in research related to the combustion of biofuels.

He has carried out simultaneous work on structural modification of **carbonaceous compounds** and optimization of **graphene production**, as well as research on the modification of materials for supercapacitors.

Since 2015 Prof. Juan A. Conesa is **Head of the research group "Waste, Energy, Environment and Nanotechnology (REMAN)"** (http://web.ua.es/reman/) and leader of the research line "Energy Recovery from Waste and Detection of Contaminants" within the group. The REMAN group, belonging to the Department of Chemical Engineering and the University Institute of Chemical Process Engineering of the University of Alicante, is currently composed by 6 Professors, 3 Senior Lecturers, 2 Postdoctoral researchers and 4 graduate PhD students.

He has authored more than **140 scientific publications** in high impact peer-reviewed international journals and has directed over **60 research projects** and **12 theses** in the field of waste recovery. He has presented more than **160 contributions to conferences**, both national and international ones; it is worth to highlight the following ones as invited speaker: *V Reunión Nacional de Dioxinas, Furanos y Compuestos Orgánicos Persistentes Relacionados* (Barcelona, 2017), *14th International Congress on Combustion By-Products and Their Health Effects* (Umeå, 2015), *7th International Symposium on Feedstock Recycling of Polymeric Materials* (New Delhi, 2013), *Química Fusión* (Valencia, 2011) and *X Congreso Mediterráneo de Ingeniería Química* (Barcelona, 2005).

RELEVANT MERITS

Publications

Five most cited publications over the last 10 years:

Conesa, J.A., Domene, A. Biomasses pyrolysis and combustion kinetics through n-th order parallel reactions (2011) Thermochimica Acta, 523 (1-2), pp. 176-181. Cited 83 times.

Conesa, J.A., Rey, L., Egea, S., Rey, M.D. Pollutant formation and emissions from cement kiln stack using a solid recovered fuel from municipal solid waste (2011) Environmental Science and Technology, 45 (13), pp. 5878-5884. Cited 63 times.

Ortuño, N., Conesa, J.A., Moltó, J., Font, R. Pollutant emissions during pyrolysis and combustion of waste printed circuit boards, before and after metal removal (2014) Science of the Total Environment, 499, pp. 27-35. Cited 53 times.

Moltó, J., Egea, S., Conesa, J.A., Font, R Thermal decomposition of electronic wastes: Mobile phone case and other parts (2011) Waste Management, 31 (12), pp. 2546-2552. Cited 48 times.

Iñiguez, M.E., Conesa, J.A., Fullana, A. Microplastics in Spanish Table Salt (2017) Scientific Reports, 7 (1), art. no. 8620. Cited 32 times.

Author of the book "Chemical Reactor Design: Mathematical Modeling and Applications", Wiley VCH, 2019

Research projects and grants

Selected projects over the last 10 years:

Name of the project: Control of the formation of halogenated organic pollutants in the thermal treatment of waste by means of pretreatment and inhibition (CTQ2016-76608-R)	
Funding entity:	Ministry of Economy, Industry and Competitiveness (Spain)
Participating entities:	University of Alicante (Spain)
Start date: 30/12/2016	**End date:** 29/06/2020
Name of the project: Energy recovery from bulky wastes and optimization of Top-Down production of graphene (PROMETEOII/2014/007)	

Funding entity:	Department for Education, Culture and Sport from the Valencian Community Government (Spain)
Participating entities:	University of Alicante (Spain)

Start date: 01/01/2014 **End date:** 31/12/2017

Name of the project: Thermal treatment of bulky and electronic waste: characterization and formation/destruction of dioxins, PCBs and other contaminants (CTQ2013-41006-R)

Funding entity:	Ministry of Economy and Competitiveness (Spain)
Participating entities:	University of Alicante (Spain)

Start date: 01/01/2014 **End date:** 31/12/2016

Name of the project: Alternative energies for the use of biomass and waste: process analysis and pollution analysis (CTQ2008-05520)

Funding entity:	Ministry of Education and Science

Participating entities:	University of Alicante (Spain)
Start date: 01/01/2009	**End date:** 30/04/2014
Name of the project: Waste treatments: formation paths of dioxins, brominated dioxins, mechanisms and development of complex kinetic models (PROMETEO/2009/043)	
Funding entity:	Department for Education from the Valencian Community Government (Spain)
Participating entities:	University of Alicante (Spain)
Start date: 01/01/2009	**End date:** 31/12/2013

Contracts

Selected contracts over the last 10 years:

Name of the project: Continuous sampling of atmospheric emissions of dioxins and other pollutants in a cement factory (CEMEX1-12I)

Funding entity:	CEMEX ESPAÑA, S.A.
Start date: 26/10/2012	**End date:** 30/10/2013
Principal investigator:	CONESA FERRER, JUAN ANTONIO

Name of the project: Research on obtaining graphene oxide nanoplates from carbon nanofibers and its purification, reduction and controlled deposition (GRUPOANTOLIN5-11I)

Funding entity:	GRUPO ANTOLIN INGENIERÍA, S.A.
Start date: 02/05/2011	**End date:** 01/05/2013
Principal investigator:	MARTIN GULLON, IGNACIO

Name of the project: Emission control during the feeding of residue derived fuel to the clinker oven (CEMEX1-08I)

Funding entity:	CEMEX ESPAÑA, S.A.
Start date: 05/11/2008	**End date:** 05/11/2009
Principal investigator:	CONESA FERRER, JUAN ANTONIO

Name of the project: Emission control during the feeding of residue derived fuel to the clinker oven (CEMEX1-09D)	
Funding entity:	CEMEX ESPAÑA, S.A.
Start date: 04/11/2008	**End date:** 04/11/2009
Principal investigator:	CONESA FERRER, JUAN ANTONIO

Management

Academic positions at the University of Alicante:

- **Secretary of the Departament** of Chemical Engineering (academic year 2000/01).
- **Vice-Dean** of Chemical Engineering (May 2005 – September 2009).
- **Deputy Director of the Polytechnic School** (October 2009 – February 2010).

Editorial positions:

- **Editor** for the scientific journal

  Energies (ISSN 1996-1073) (February 2018 – now). https://www.mdpi.com/journal/energies

Awards

- San Alberto Magno Prize for Research in Chemistry (2nd edition) for the bachelor thesis (November 1994).
- Extraordinary Doctorate Award 1996/97 in the program of Chemical Engineering of the University of Alicante.
- III Impulse Awards of the University of Alicante for the business project "GOPRO: Preparation of Graphene-based products for Application in Conductive Inks and Surface Coatings" (2013).