INTRODUCTION

Hi there! I´m Isabel and I think I have the soul of an artist. I always felt the need to do things with my hands, my head and my heart.

I hate hypocrisy and I really love beauty.

PROFESSIONAL SKILLS

Applied Thermodynamics:
-Phase equilibria
-Thermophysical properties
Analysis of uncertainties
and Treatment of data

CONTACT DETAILS

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MY INTERESTS

Painting
Cooking
Photography
Writing
Swimming

Isabel Maria Almeida Fonseca

Associate professor with aggregation

Curriculum

PhD in Chemical Engineering, University of Coimbra (UC), Applied Thermodynamics, Master in Chemical-Physics by the Department of Chemistry of FCTUC and graduated in Chemical Engineering by UC. She is currently Associate Professor with Aggregation by the same institution. She was vice-president of the Executive Committee in the period 2005-2006. Belonged to the Graduate Studies Committee from 1994-1999 and to the Cientific Committee of the Master in Biochemical Engineering (2002-2006). Among the main research interests are the determination of the ELV of mixtures of liquefied gases at low temperatures by the technique developed by Staveley. This procedure was generalized to ternary mixtures in our laboratory. Other field of study is G / L solubility at room temperatures and atmospheric pressure. Taking into account its previous training, has developed work in the field of Experimental Data Treatment. She is the author of the books "Experimental uncertainties, adjustments and other things" (Gradiva, 2010) and "Fundamentals of Energy Balances" (Impressa UC, 2009).

Academic Qualifications

2013 – Aggregation, University of Coimbra/Depart. of Chemical Engineering
1991 - PhD in Chemical Thermodynamics, University of Coimbra
1985 - MSc in Chemical Physics, Chemical Department
1980 – Graduation

Research Areas

Phase Equilibria at low temperatures
Solubility of gases in liquids
Thermophysical Properties of Fluids (ionic liquids, nanoparticles and organic compounds)
Treatment of data and analysis of uncertainties.

Course Units (taught in recent years)

Integrated Master in Chemical Engineering:

Material and Energy Balances, Chemical Thermodynamics, Chem. Eng. Laboratories II, Dissertation in Chem. Eng., Seminar.

Integrated Master in Environmental Engineering:

Thermodynamics, Physical Chemistry, Physical - Chemical Treatments

Funded Research Projects

Coordination of the project “Chemical Effects on Gas/Liquid Solubility", POCTI/EQU/44056/2002, 2003-06.

Participation as the research project entitled "Thermodynamic Properties of Liquefied Gas Mixtures" - POCTI/EQU/2692/2001.

Collaboration in the project " Studies on Heat Transfer Characteristics under Horizontal, Vertical and Inclined Flow Conditions" (PTDC/EME-MFE/66482/2006). PTDC/EME-MFE/66482/ funded by the Portuguese Foundation for Science and Technology (FCT), 2007-2009. University of Aveiro and FCTUC.

Collaboration in the project "Selection of ionic liquids as solvents" (POCI/EQU/58152/2004), FCT, Department of Chemistry of the University of Aveiro.

Participation in the project "Thermodynamic Properties of Mixtures of Polar Liquids at Low Temperatures", 204.80.11, JNICT and OTAN, (1980 - 1983).

Thesis supervisions

Chemical Effects on Gas/liquid Solubilities, José Manuel Matias Vieira de Sousa, Assistant of ISEC, PhD Thesis, 2016.

Thermodynamic Properties of Liquefied Gases, Ana Maria Pontedeira Senra, PhD Thesis, Universidade de Coimbra, 2006 (co-supervision of Professor Doutor Lélio Q. Lobo).

Surface tension and densities of mixtures of ionic liquids with water and ethanol at various temperatures, Esther Rilo Siso, bachelor, Department of Physics, University of A Coruña (Spain), PhD, (collaboration), 2008-2010.

Recovery of heavy metals from industrial effluents using ionic exchanged resins impregnated

with ionic liquids, Diogo Vieites Amoedo, Ms Thesis, 2016 (co-supervision of Professor Licínio M. G. A. Ferreira).

Determination of the Density of Ionic Liquids based on Quaternary Phosphonium Trihexyl (tetradecyl) phosphonium Tris (pentafluoroethyl) trifluorophosphate, Carlos Emanuel Neto Ferreira, Ms Thesis, 2011, (co- orientation of Professor Abel M. Ferreira).

Thermophysical Properties of water+ethyl acetate+ethanol mixture, Rui Miguel Martins Pires, Ms Thesis, 2004, (co-supervision of Professor Abel M. Ferreira).

Other Supervisions

* Irudayaraj Johnson, PhD. in Physics from the University of Bharathidasan, St. Joseph College, Trichy, India, held a post-doc in 2005, in the experimental determination of surface and interfacial tensions of the ternary mixture (water + n-butyl acetate + propanol) at 303.15 K and at atmospheric pressure.

* Ramesh L. Gardas, PhD. in Physics from the University of Bharathidasan, St. Joseph College, Trichy, India, held a postdoctoral fellowship in 2005, entitled PVT Properties of High-Pressure Aliphatic Esters (co-supervised by Professor Abel M. Ferreira).

* Mirjana Kijevcanin, Ph.D. in Chemical Engineering, Faculty of Technology and Metallurgy, University of Belgrade, Serbia, held a postdoc in 2002, entitled Experimental determination of surface and interfacial tensions of binary and ternary mixtures of the water + methanol + ester system at ambient temperatures (co-supervised by Professor Abel G. M. Ferreira).

* Belina M. Santos, with a degree in Chemical Engineering, held an internship during 2001 (with the co-orientation of Professor Abel G. M. Ferreira) entitled Surface and interfacial tension studies of the system (water + methanol + n-pentyl acetate).

* José P. Almeida graduated in Chemistry from the Department of Chemistry of the University of Coimbra, with a (BI) grant, carried out a work entitled, “Assembly and test of an apparatus for determination of G/L solubilities”, in the scope of the project Chemical Effects on Gas / Liquid Solubility, (2007).

* Henrique F. Costa, graduated in Chemical Engineering, undertook an internship in 2007, with the designation, “Viscosity and Density measurements of organic mixtures” (co-supervision of Professor Abel M. Ferreira).

* Filipa A. M. Gonçalves, graduated in Chemistry, fellowship (BI) in 2010 under the project, Thermal Behavior of Nanofluids when subject to Horizontal, Vertical and Inclined Flow (with the co-supervision of Professor Abel M. Ferreira).

Publications

Scientific journals

Articles are grouped into different domains according to the dominant content.

Phase Equilibria Domain

Thermodynamics of Liquid Mixtures of Xenon and Methyl Fluoride
Fonseca I. M. A., Lobo L. Q., *Fluid Phase Equilibria*, 47 (1988) 249-263.

A Note on some Thermodynamic Properties of Methyl Fluoride
Fonseca I. M. A., Lobo L. Q., *Rev. Port. Química*, 31 (1989) 118-121.

Ternary Contribution to the Excess Gibbs Energy for a Liquid Mixture Involving Molecularly Simple Polar Components
Lobo L. Q., Fonseca I. M. A*., Molec. Phys.*, 80 (1993) 789-794.

Vapour-Liquid Equilibrium of (Ammonia + Xenon) at 195.48 K
Fonseca I. M. A., Lobo L. Q., *J. Chem. Thermodynamics*, 26 (1994) 333-336.

(Vapour + Liquid) Equilibrium of (Methyl Fluoride + Dinitrogen Oxide) at the Temperature 182.33 K
Lobo L. Q., Fonseca I. M. A., *J. Chem. Thermodynamics*, 26 (1994) 647-650.

The Triple-point of Methyl Fluoride
Fonseca I. M. A., Lobo L. Q., *J. Chem. Thermodynamics*, 26 (1994) 671- 672.

VLE for Cryogenic Methyl Fluoride + Nitrous Oxide + Xenon, at 182.33 K
Fonseca I. M. A., Lobo L. Q., *Fluid Phase Equilibria*, 113 (1995) 127-138.

(Vapour + Liquid) equilibria of (fluoromethane + tetrafluoromethane) at temperature 130.46 K
Fonseca I. M. A., Sardinha G. G., Lobo L. Q., *J. Chem. Thermodynamics*, 30 (1998) 1271-1274.

VLE of x CH3F + (1-x) HCl) at T=159.01 K and 182.33 K
Senra M. P., Fonseca, I. M. A., Ferreira, A. G. M., Lobo, L. Q., *J. Chem. Thermodynamics*, 34 (2002) 1557-1566.

(Vapour + Liquid) equilibria of (x CH3Cl + (1-x) CH3F) at temperatures of 159.01 K and 182.33 K
Senra, M. P., Fonseca, I. M. A., Lobo, L. Q., *J. Chem. Thermodynamics*, 35 (2003) 1051-1057.

(Vapour + Liquid) Equilibria of {xCH3Cl + (1-*x*) HCl} at temperatures of

159.01 K and 182.33 K
Senra, M. P., Fonseca, I . M. A., Lobo, L. Q., *J. Chem. Thermodynamics*, 37 (2005) 627-630.

Vapour pressure and excess Gibbs free energy of the ternary system {x1 CH3F + x2 HCl + x3 N2O} at temperature of 182.33 K
L.Q. Lobo, I. M. A. Fonseca, A. G. M. Ferreira, A. M. P. Senra, *J. Chem. Thermodynamics*, 38 (2006) 1532-1538.

Vapour pressure and excess Gibbs free energy of binary mixtures of hydrogen sulphide with ethane, propane, and n-butane at temperature of 182.33 K
A. M. P. Senra, I. M. A. Fonseca, A. G. M. Ferreira, L. Q. Lobo, *J. Chem. Thermodynamics*, 38 (2006) 1651-1654 *(Top 25, Oct-Dec 2006)*

Solubility of Methyl Fluoride in some Alcohols
Silva C. S. O., Fonseca I. M. A., Lobo L. Q., *Fluid Phase Equilibria*, 135 (1997) 137-144.

Solubilities of Some New Refrigerants in water
Miguel A. A. F., Ferreira A. G. M., Fonseca I. M. A., *Fluid Phase Equilibria*, 173 (2000) 97-107.

Automated apparatus for gas solubility measurements
I. M. A. Fonseca, J. P. B. Almeida, H. C. Fachada, *J. Chem. Thermodynamics*, 39 (2007) 1407-1411.

A Simple Experiment to Understand Gas/Liquid Solubility
I. M. A. Fonseca, J. P. B. Almeida, H. C. Fachada, *Chem. Eng. Edu*., 42 (2008) 147-153.
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Solubility of CF4 in lower alcohols
J. M. M. V. Sousa, A. G. M. Ferreira, H. C. Fachada, I. M. A. Fonseca, *Fluid Phase Equilibria,* 296 (2010) 95–98.

Solubility of HFCs in lower alcohols
J. M. M. V. Sousa, J. P. B. Almeida, A. G. M. Ferreira, H.C. Fachada, I. M. A. Fonseca, *Fluid Phase Equilibria*, 303 (2011) 115–119.

Solubility of hydrofluorocarbons in aromatic solvents and alcohols: experimental data and modeling with CPA EoS
J. M. M. V. Sousa, A. J. Queimada, E. A. Macedo, I. M. A. Fonseca, *Fluid Phase Equilibria*, 337 (2013) 60 – 66.

Solubilities of hydrofluorocarbons in ionic liquids: Experimental and modelling study.

Sousa, M.M.V. Granjo, J. F.O., Queimada, A. J., Ferreira, A.G.M., Oliveira, N. M.C., Fonseca, I. M.A., Fonseca, *J. Chem. Thermodynamics* 73 (2014) 36-43

Solubility of hydrofluorocarbons in phosphonium-based ionic liquids: Experimental and modelling study
José M.M.V. Sousa, José F.O. Granjo, António J. Queimada, Abel G.M. Ferreira , Nuno M.C. Oliveira, Isabel M.A. Fonseca, *J. Chem. Thermodynamics* 79 (2014) 184–191.

Solubility of Hydrofluorocarbons in Halobenzene Solvents
José M. M. V. Sousa and Isabel M. A. Fonseca, *J.Chem.Eng.Data* , 59 (2014) 3605-3609.

In the field of Data Processing

Some Thermodynamic Properties of Hydrogen Chloride and Deuterium Chloride
Henderson C., Lewis D. G., Prichard P. C., Staveley L. A. K., Fonseca I. M. A., Lobo L. Q., *J. Chem. Thermodynamics*, 18 (1986) 1077-1088.

Some Thermodynamic Properties of Liquid Hydrogen Sulphide and Deuterium Sulphide
Cubitt A. G., Henderson C., Staveley L. A. K., Fonseca I. M. A., Ferreira A. G. M., Lobo L. Q., *J. Chem. Thermodynamics*, 19 (1987) 703-710.

Some Thermodynamic Properties of Liquid Ammonia and Trideuteroammonia
Streatfield M. H., Henderson C., Staveley L. A. K., Ferreira A. G. M., Fonseca I. M. A., Lobo L. Q., *J. Chem. Thermodynamics*, 19 (1987) 1163-1171.

Error Analysis in Barker's Method: Extension to Ternary Systems
Fonseca I. M. A., Lobo L. Q., *Fluid Phase Equilibria*, 154 (1999) 205-211.

In the field of thermophysical properties

Densities and Excess Molar Volumes of Water + Butyl Acetate + Propano-1-ol and its Constituent Binaries at 303.15 K
Natividade N. A. T., Ferreira A. G. M., Fonseca I. M. A**.**, *J. Chem. Eng. Data*, 42 (1997) 1232-1234.

Densities and Viscosities of the Ternary Mixtures Water + Butyl Acetate + Methanol and Water + Ethyl Propionate + Methanol at 303.15 K
Visak Z. P., Ferreira A. G. M., Fonseca I. M. A., *J. Chem. Eng. Data*, 45 (2000) 926-931.

Surface and Interfacial Tensions of the Systems Water + N-Pentyl Acetate + Methanol at 303.15 K
Santos B. M. S., Ferreira A. G. M., Fonseca I. M. A., *Fluid Phase Equilibria*, 208 (2003) 1-21.

Viscosity and Density Data of the System Water + N-Pentyl Acetate + Methanol. Calculation with a modified Redlich-Kwong-Soave Equation of State
Giro, F., Gonçalves, M. F., Ferreira A. G. M., Fonseca I. M. A., *Fluid Phase Equilibria*, 204 (2003) 217-232.

Densities, Viscosities, and Surface and Interfacial Tensions of the Ternary Mixture Water + Ethyl Butyrate + Methanol at 303.15 K
Kijevcanin, Lj. M., Ribeiro, I. S. A., Ferreira, A. G. M., Fonseca, I. A. M., *J. Chem. Eng. Data*, 48 (2003) 1266-1270.

Water + Esters + Methanol: Experimental data, correlation and prediction of surface and interfacial tensions at 303.15 K and atmospheric pressure
Kijevcanin, Lj. M., Ribeiro, I. S. A., Ferreira, A. G. M., Fonseca, I. A. M., *Fluid Phase Equilibria,* 218 (2004) 141- 148.

PVT Property Measurements for Some Aliphatic Esters from (298 to 393) K and up to 35 MPa
R. L. Gardas, I. Johnson, D. M. D. Vaz, I. M. A. Fonseca, A. G. M. Ferreira, *J. Chem. Thermodynamics,* 52 (2007) 737-751.

Viscosity and Density of Water + Ethyl Acetate + Ethanol Mixtures at 298.15 K and Atmospheric Pressure
R. M. Pires, H. F. Costa, A. G. M. Ferreira, I. M. A. Fonseca, *J. Chem. Eng. Data*, 52 (2007) 1240-1245.

High-Pressure Densities and Derived Thermodynamic Properties of Imidazolium-Based Ionic Liquids
R. L. Gardas, M. G. Freire, P. J. Carvalho, I. M. Marrucho, I. M. A. Fonseca, A. G. M. Ferreira, J. A. P. Coutinho, *J. Chem. Eng. Data*, 52 (2007) 80-88 (*TOP 3, 2007*).

P ϱ T Measurements of Imidazolium-Based Ionic Liquids
L. G. Ramesh, M. G. Freire, P. J. Carvalho, I. M. Marrucho, I. M. A. Fonseca, A. G. M. Ferreira, J. A. P. Coutinho, *J. Chem. Eng. Data,* 52 (2007) 1881-1888.

Densities and Derived Thermodynamic Properties of Imidazolium-, Pyridinium-, Pyrrolidinium-, and Piperidinium-Based Ionic Liquids
R. L. Gardas, H. F. Costa, M. G. Freire, P. J. Carvalho, I. M. Marrucho, I. M. A.

Fonseca, A. G. M. Ferreira, J. A. P. Coutinho, *J. Chem. Eng. Data,* 53 (2008) 805-811.

Measurements and Correlation of High-Pressure Densities of Imidazolium-Based Ionic Liquids
Luciana I. N. Tomé, Pedro J. Carvalho, Mara G. Freire, Isabel M. Marrucho, Isabel M. A. Fonseca, Abel G. M. Ferreira, João A. P. Coutinho, and Ramesh L. Gardas, *J. Chem. Eng. Data,* 53 (2008) 1914–1921.

Viscosities of Liquid Fluorocompounds
M. G. Freire, A. G. M. Ferreira, I. M. A. Fonseca, P. J. Carvalho, I. M. Marrucho, J. A. P. Coutinho, *J. Chem. Eng. Data*, 53 (2008) 538-542.

Density, Viscosity, and Surface and Interfacial Tensions of Mixtures of Water + N-Butyl Acetate + 1-Propanol at 303.15 K and Atmospheric Pressure
I. Johnson, H. F. Costa, A. G. M. Ferreira, I. M. A. Fonseca, *Int. J. Thermophys*., 29 (2008) 619-633.

PVT Property Measurements for Ethyl Propionate, Ethyl Butyrate, and Ethyl Pentanoate Esters from (298 to 393) K and up to 35 MPa
Henrique F. Costa, Ramesh L. Gardas, Irudayaraj Johnson, I. M. A. Fonseca, and Abel G. M. Ferreira, *J. Chem. Eng. Data*, 54 (2009) 256 – 262.

Liquid-Liquid Equilibria, Density, Viscosity, and Surface and Interfacial Tensions of the System Water + N-Butyl Acetate + 1-Propanol at 323.15 K and Atmospheric Pressure
Henrique F. Costa, Hélio Lourenço, Irudayaraj Johnson, Filipa A. M. M. Gonçalves, and I. M. A. Fonseca, *J. Chem. Eng. Data*, 54 (2009) 2845-2854.

PVT, viscosity and surface tension of ethanol: new measurements and literature data revision
F. A. M. M. Gonçalves, A. R. Trindade, C. S. M. F. Costa, J. C. S. Bernardo, I. Johnson, I. M. A. Fonseca, A. G. M. Ferreira, *J. Chem. Thermodynamics*, 42 (2010) 1039–1049.

Densities and derived thermodynamic properties of ternary mixtures 1-butyl-3-methyl-imidazolium tetrafluoroborate + ethanol + water at seven pressures and two temperatures
Esther Rilo, Abel G.M. Ferreira, Isabel M. A. Fonseca, Oscar Cabeza, *Fluid Phase Equilibria*, 296 (2010) 53–59.

Thermodynamic and Transport Properties of CNT- Water Based Nanofluids
J. Ponmozhi, F.A.M.M. Gonçalves, A.G.M. Ferreira, I.M.A. Fonseca, S. Kanagaraj, N. Martins, M.S.A. Oliveira, *Journal of Nano Research,* 11 (2010)101-106.

Dichloromethane: Revision and extension of p ϱ T relationships for the liquid
F.A.M.M. Gonçalves, C.S.M.F. Costa, J.C.S. Bernardo, I. Johnson, I.M.A. Fonseca, A.G.M. Ferreira, *J. Chem. Thermodynamics,* 43 (2011) 105–116.

EG/CNTs Nanofluids Engineering and Thermo-Rheological Characterization
B.C. Lamas, M.A.L. Fonseca, F.A.M.M. Gonçalves, A.G.M. Ferreira, I.M.A. Fonseca, S. Kanagaraj, N. Martins, M.S.A. Oliveira, *Journal of Nano Research,*13 (2011) 69-74.

Pressure–volume–temperature measurements of phosphonium-based ionic liquids and analysis with simple equations of state
F.A.M.M. Gonçalves, C.S.M.F. Costa, C.E. Ferreira, J.C.S. Bernardo, I. Johnson, I.M.A. Fonseca, A. G. M. Ferreira, *J. Chem. Thermodynamics* 43 (2011) 914–929.

Measurements of *pVT*, viscosity, and surface tension of trihexyltetradecylphosphonium tris(pentafluoroethyl)trifluorophosphate ionic liquid and modelling with equations of state
Carlos E. Ferreira, Nieves M.C. Talavera-Prieto, Isabel M.A. Fonseca, António T.G. Portugal, Abel G.M. Ferreira, *J.Chem. Thermodyna*mics 47 (2012) 183-196.

The viscosity of glycerol.
Abel G.M. Ferreira, Ana P.V. Egas, Isabel M.A. Fonseca, Ana C. Costa, Danielly C. Abreu, Lélio Q. Lobo, *J. Chem. Thermodynamics* 113 (2017) 162–182

Influence of temperature and pressure on the density and speed of sound of 2-hydroxyethylammonium propionate ionic liquid
João A. Sarabando, Paulo J.M. Magano, Abel G.M. Ferreira , Jaime B. Santos, Pedro J. Carvalho, Silvana Mattedi, Isabel M.A. Fonseca, *J. Chem. Thermodynamics* 122 (2018) 183–193.

Influence of temperature and pressure on the density and speed of sound of N-ethyl-2-hydroxyethylammonium propionate ionic liquid
João A. Sarabando, Paulo J.M. Magano, Abel G.M. Ferreira, Jaime B. Santos, Pedro J. Carvalho, Silvana Mattedi, Isabel M.A. Fonseca, Mário Santos, *J. Chem. Thermodynamics* 131 (2019) 303–313.

Publications of pedagogical nature

Notes on Gas / Liquid Solubility, **Chemical Engineering Notes No. 5**, I. M. A. Fonseca, University of Coimbra, 1999.

Existing Thermo-Physical Properties Data Sources in the DEQ Library, I. M. A. Fonseca and M.P.P Brito, 1999.

Phase Equilibrium in Non-Electrolyte Systems, I. M. A. Fonseca, 2000. Notes elaborated to support the discipline of Fundamentals of Chemical Engineering, within the scope of the Master in Biochemical Engineering.

Fundamentals of Energy Balance, Chemical Engineering Notes No. 7, 2002, I. M. A. Fonseca, Ana Paula V. Egas, 2002, (out of print).

Chemical Engineering Laboratories II, Chemical Engineering Notes No. 8, I.M.A. Fonseca, 2003, (in collaboration with Jorge M.S. Rocha, Jorge M.L. Ferreira, Luísa M.R. Durães and Marta H.F. Henriques).

Mass Balance and Degree of Freedom Analysis, Chemical Engineering Notes No. 9, I. M. A. Fonseca, 2007 (out of print).

Fundamentals of Energy Balance, Press of the University of Coimbra, I. M. A. Fonseca, Ana Paula V. Egas, 2009 (reprint of the Chemical Engineering Notes No. 7).

Experimental Uncertainties, Adjustments and Other Things, Isabel M. A. Fonseca, Gradiva Publishing House, 2010.

A Simple Experiment to Understand Gas / Liquid Solubility
I. M. A. Fonseca, J. P. B. Almeida, H. C. Fachada, Chem. Eng. Edu., 42 (2008) 147-153.

Experimental Errors - A Pedagogical Approach - Part I
Fonseca, I. M A., Bulletin Portuguese Society of Chemistry, October-December 2004, 37-41.

Two alternative forms of the energy balance equation to a reactor
Fonseca, I.A. M., Bulletin Portuguese Society of Chemistry, 110 (2008) 27-31.

Problems of Mass and Energy Balances, Isabel M. A. Fonseca, 2014. (Notebook of problems to support the course of Energy and Material Balances, 2nd year of the Integrated Master of Chemical Engineering).

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