

DOMENEK Sandra

Birth date: 9 August 1974, Austria

since 2006 **Associate Professor AgroParisTech**

UMR 1145 GENIAL – Ingénierie Procédés Aliments (INRA/AgroParisTech)

Team Interactions Matériaux Milieux au Contact (IMMC)

1 rue des Olympiades, 91477 Massy cedex, France

Phone: +33 (0)169 935 068; Fax: +33 (0)169 935 044, email: sandra.domenek@agroparistech.fr

Diploma

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| 1999 | Master Degree in Chemistry and Biotechnology , Technical University Graz/ Austria |
| 2003 | Doctorate Degree in Food Sciences and Chemistry , SupAgro Montpellier/ France |
| 2014 | Habilitation in Material Chemistry , University Paris Sud Orsay/France |

Research Positions

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| since January 2006 | Associate Professor Food Science and Packaging – AgroParisTech
UMR 1145 GENIAL, Ingénierie Procédés Aliments, équipe I2MC |
| 2004 –2005 | Assisatant Professor in Polymer Science – University Paris XII – Val de Marne
Laboratoire de Recherche sur les Polymères (LRP) – CNRS Thiais, |
| 1999 –2003 | Doctorate Position for PhD thesis in Food Science
U.M.R. 1208 CIRAD-ENSA M-INRA-UM II Ingénierie des Agropolymères et Technologies Emergentes - Montpellier |

Research Interests

Food packaging is one of the main operations in food processing, as virtually every food product is packed. Food packaging is also the main application of polymer materials. Today, both sectors are facing the challenge to contribute to increasing sustainability of materials and manufacturing industry. Within this framework I am interested in developing novel biobased and biodegradable polymers meeting the quality and safety requirements of food packaging. Furthermore, I am interested in novel packaging concepts aiming at decreasing food losses during retailing and in the consumers' household. I am developing scientific expertise on the physico-chemistry of polymers to get insight into structure/function relationships of transport properties of small molecules in dense membranes. This expertise is mainly applied to tune barrier properties of polymers and control interaction phenomena between foodstuff and packaging due to mass transfer.

Within this context I have participated or am participating in the coordination of 5 national or international collaborative research projects and in the supervision of 8 doctorate thesis.

Teaching

My teaching activity includes lectures, laboratory courses and project supervision in both food and polymer sciences for undergraduate and postgraduate students. I am also participating in international training missions for undergraduate students. The main subjects are food texture formulation, rheology, calorimetry, polymer physical chemistry, polymer synthesis, packaging technology, bioplastics, biopolymers, and ecodesign of polymer materials. I am co-coordinating the training course of biorefinery and green chemistry of AgroParisTech. Furthermore, I am regularly participating in juries for the delivery of master and doctorate degrees.

Membership in Scientific Associations and Networks

AFCAT	French association of calorimetry and thermal analysis - elected member of the advisory board
GFP	French group of polymer scientists
RMT PropackFood	French network on food packaging – group leader for functional packaging
Nanocellulose	French group on nanocellulose research

Responsibilities

Since 2017	Group leader of the research team Interactions Materials/Contact Media (I2MC) of the research unit UMR Ingénierie Procédés Aliments (16 staff members)
Since 2017	Project Manager of the joint technological research unit UMT SafeMat – Safety of packaging materials (8 staff members)
Since 2016	Elected member of the Teachers' Advisory board of AgroParisTech
2014-2018	Member of the advisory board of the Biotechnology Chair ABI – Agro Biotechnologies Industrielles (Pomacle Bazancourt, France)

Research Projects

2010-2014	Coordinator of the national French research project BIP-ADEME “Creabiom” – Development of biodegradable multilayers for food packaging using the byproducts of the vegetable oil industry Partnership: 2 industrials; 2 academic laboratories; 2 technology transfer centres (total cost 1.3 Million €)
2017-2021	Coordinator of the national French research project ANR “GASP” – Development of biobased high barrier food packaging Partnership: 2 industrials, 2 start-ups, 5 academic laboratories (total cost 2.5 Million €)
2014-2016	Participation to the project Marie Curie Actions— International Research Staff Exchange Scheme (IRSES) REPLAY - Reducing Post-Harvest Losses To Increase Food Sustainability n°318920

Co-Direction of PhD-projects

1. Cécile Courgneau 2007-2011 “Understanding of gas transport mechanisms in polylactide”
Co-director: Violette Ducruet (UMR GENIAL) (5 publications)
2. Romulo Salazar 2009-2013 “Impact of polylactide (PLA) on the quality of food products in contact”
Co-director: Violette Ducruet (UMR GENIAL) (3 publications)
3. Etzael Espino Perez 2011-2014 “Valorization of polysaccharide nanocrystals obtained from byproducts of the food industry”
Co-directeur: Julien Bras (UMR LGP2) (5 publications)
4. Alexandre Ruellan 2011-2015 “Formulation of PLA with by-products of the oil industry”
Co-director: Cyrille Sollogoub (UMR PIMM)
5. Armando Reano 2013-2016 “Synthesis and application of phenolic biobased polyesters”
Co-director: Florent Allais (chaire ABI) (4 publications)
6. Samira Fernandes Nassar 2013-2017 « Understanding of structure/function relationships of microstructure, molecular mobility and barrier properties of PLA”
Co-director: Cyrille Sollogoub (UMR PIMM)(2 publications, 1 submitted)
8. Louis Hollande 2016-2019 « Synthesis and physicochemical study of the application potential of polyesters based on synthons of from lingo-cellulosic biomass”
Co-director: Florent Allais (chaire ABI) (1 submitted publication)

9. Hajar Faraj 2017-2020 « Development of nanostructured biobased polymers with high gas barrier”
Co-directeur : Cyrille Sollogoub (UMR PIMM)

Publications

h-index: 16 (Web of Knowledge), 39 articles in international journals, 15 conference proceedings, 4 book chapters, 1 patent on biobased packaging, 47 oral conferences and 74 poster in international congresses

1. Kraemer-Schafhalter, A., Domenek, S., Boehling, H., Feichtenhofer, S., Griengl, H., Voss, H., 2000. Optimization of the hydroxylation of 2-cyclopentylbenzoxazole with *Cunninghamella blakesleeana* DSMZ 1906. *Applied Microbiology and Biotechnology*, 53, 266-271.
2. Domenek, S., Morel, M.H., Bonicel, J., Guilbert, S., 2002. Polymerization kinetics of wheat gluten upon thermosetting. A mechanistic model. *Journal of Agricultural and Food Chemistry*, 50, 5947-5954.
3. Domenek, S., Brendel, L., Morel, M.H., Guilbert, S., 2004. Influence of degree of protein aggregation on mass transport through wheat gluten membranes and their digestibility - An in vitro study. *Cereal Chemistry*, 81, 423-428.
4. Domenek, S., Brendel, L., Morel, M.H., Guilbert, S., 2004. Swelling Behavior and structural characteristics of wheat gluten polypeptide films. *Biomacromolecules*, 5, 1002-1008.
5. Domenek, S., Feuilloley, P., Gratraud, J., Morel, M.H., Guilbert, S., 2004. Biodegradability of wheat gluten based bioplastics. *Chemosphere*, 54, 551-559.
6. Domenek, S., Langlois, V., Renard, E., 2007. Bacterial polyesters grafted with poly(ethylene glycol): Behaviour in aqueous media. *Polymer Degradation and Stability*, 92, 1384-1392.
7. Chhabra, R.P., Bouvier, L., Delaplace, G., Cuvelier, G., Domenek, S., Andre, C., 2007. Determination of mixing times with helical ribbon impeller for non-Newtonian viscous fluids using an advanced imaging method. *Chemical Engineering & Technology*, 30, 1686-1691.
8. Domenek, S., Petit, E., Ducept, F., Muzdour, S., Brambati, N., Ridoux, C., Guedj, S., Michon, C., 2008. Influence of concentration and ionic strength on the adsorption kinetics of gelatin at the air/water interface. *Colloids and Surfaces a-Physicochemical and Engineering Aspects*, 331, 48-55.
9. Colomines, G., Ducruet, V., Courgneau, C., Guinault, A., Domenek, S., 2010. Barrier properties of poly(lactic acid) and its morphological changes induced by aroma compound sorption. *Polymer International*, 59, 818-826.
10. Courgneau, C., Domenek, S., Guinault, A., Avérous, L., Ducruet, V., 2011. Analysis of the Structure-Properties Relationships of Different Multiphase Systems Based on Plasticized Poly(Lactic Acid). *Journal of Polymers and the Environment*, 19, 362-371.
11. Courgneau, C., Domenek, S., Lebossé, R., Guinault, A., Averous, L., Ducruet, V., 2012. Effect of crystallization on barrier properties of formulated polylactide. *Polymer International*, 61, 180-189.
12. Guinault, A., Sollogoub, C., Ducruet, V., Domenek, S., 2012. Impact of crystallinity of poly(lactide) on helium and oxygen barrier properties. *European Polymer Journal*, 48, 779-788.
13. Salazar, R.M., Domenek, S., Courgneau, C., Ducruet, V., 2012. Plasticization of poly(lactide) by sorption of volatile organic compounds at low concentration. *Polymer Degradation and Stability*, 97, 1871-1880.
14. Courgneau, C., Ducruet, V., Averous, L., Grenet, J., Domenek, S. 2013. Non-isothermal crystallization kinetics of poly(L,D-lactide) - effect of plasticizers and nucleating agent *Polymer Engineering & Science*, 53, 1085-1098.
15. Phuong Nguyen, T., Domenek, S., Guinault, A., Boukehili, H., Sollogoub, C. 2013. Crystallization behavior of poly(D,L-lactide)/ poly(β -hydroxybutyrate)/talc composites. *Journal of Applied Polymer Science*, 192, 3355-3365.
16. Domenek, S., Louaifi, A., Guinault, A., Baumberger, S. 2013. Potential of lignins as functional additive in biodegradable materials. Accepted after revision in *Journal of Polymers and the Environment*, 21, 692-701.
17. Fang X., Domenek S., Ducruet V., Refregier M., Vitrac O. 2013. Diffusion of aromatic solutes in aliphatic polymers above glass transition temperature. *Macromolecules*, 46, 874-88.
18. Espino Perez, E., Bras, J., Ducruet, V., Guinault, A., A. Dufresne, Domenek, S. 2013. Influence of surface chemical modification of cellulose nanowhiskers on mechanical and barrier properties of bionanocomposites based poly(lactide). *European Polymer Journal*, 49, 3144-3154.
19. Salazar R, Domenek S, Ducruet V. 2014. Sorption of oil and aroma compounds from model food emulsions in poly(lactide). *Food Chemistry*, 148, 138-146.
20. Espino, E., Cakir, M., Domenek, S., Román-Gutiérrez, A.D., Belgacem, N., Bras, J. 2014. Isolation and characterization of cellulose nanocrystals from industrial by-products of Agave tequilana and barley.

- Industrial Crops and Products, 62(0), 552-559.
21. Espino-Pérez, E., Domenek, S., Belgacem, N., Sillard, C., Bras, J. 2014. Green Process for Chemical Functionalization of Nanocellulose with Carboxylic Acids. *Biomacromolecules*. 15 (12), 4551-4560.
 22. Dobircau, L., Delpouve, N., Herbinet, R., Domenek, S., Le Pluart, L., Delbreilh, L., Ducruet, V., Dargent, E. 2015. Molecular mobility and physical ageing of plasticized poly(lactide). *Polymer Engineering & Science*, 55, 858-865.
 23. Ruellan, A., Guinault, A., Sollogoub, C., Ducruet, V., Domenek, S. 2015. Solubility Factors as Screening Tools of Biodegradable Toughening Agents of Polylactide. *Journal of Applied Polymer Science, Special Issue: Manufacturing of Advanced Biodegradable Polymeric Components*. DOI: 10.1002/APP.42476
 24. Ruellan, A., Guinault, A., Sollogoub, C., Chollet, G., Ait-Mada, A., Ducruet, V., Domenek, S. (2015). Industrial vegetable oil by-products increase the ductility of polylactide. *Express Polymer Letters*, 9 (12), 1087-1103.
 25. Monnier, X., Delpouve, N., Basson, N., Guinault, A., Domenek, S., Saiter, A., Mallon, P. E., Dargent, E. (2015). Molecular dynamics in electrospun amorphous plasticized polylactide fibers. *Polymer*. Polymer. 73, 68-78.
 26. Reano AF, Cherubin J, Peru AMM, Wang Q, Clement T, Domenek S, Allais F (2015) Structure-Activity Relationships and Structural Design Optimization of a Series of p-Hydroxycinnamic Acids-Based Bis- and Trisphenols as Novel Sustainable Antiradical/Antioxidant Additives. *ACS Sustainable Chemistry & Engineering* 3:3486-3496.
 27. Kassouf, A., Ruellan, A., Jouan-Rimbaud Bouveresse, D., Rutledge, D. N., Domenek, S., Maalouly, J., Chebib, H., & Ducruet, V. (2016). Attenuated total reflectance-mid infrared spectroscopy (ATR-MIR) coupled with independent components analysis (ICA): A fast method to determine plasticizers in polylactide (PLA). *Talanta*, 147, 569-580.
 28. Espino-Perez, E., Gilbert, R. G., Domenek, S., Brochier-Salon, M. C., Belgacem, M. N., & Bras, J. (2016). Nanocomposites with functionalised polysaccharide nanocrystals through aqueous free radical polymerisation promoted by ozonolysis. *Carbohydrate Polymers*, 135, 256-266.
 29. Reano AF, Pion F, Domenek S, Ducrot P-H, Allais F (2016) Chemo-enzymatic preparation and characterization of renewable oligomers with bisguaiaicol moieties: promising sustainable antiradical/antioxidant additives. *Green Chemistry* 18:3334-3345.
 30. Reano, A. F.; Domenek, S.; Pernes, M.; Beaugrand, J.; Allais, F. Ferulic Acid-Based Bis/Trisphenols as Renewable Antioxidants for Polypropylene and Poly(butylene succinate). *ACS Sustainable Chemistry & Engineering* 2016, 4 (12), 6562–6571.
 31. Ruellan, A.; Ducruet, V.; Gratia, A.; Saelices Jimenez, L.; Guinault, A.; Sollogoub, C.; Chollet, G.; Domenek, S. Palm oil deodorizer distillate as toughening agent in polylactide packaging films. *Polym. Int.* 2016, 65 (6), 683-690.
 32. Crouvisier-Urien, K.; Bodart, P. R.; Winckler, P.; Raya, J.; Gougeon, R. D.; Cayot, P.; Domenek, S.; Debeaufort, F.; Karbowiak, T. Bio-based composite films from chitosan and lignin: antioxidant activity related to structure and moisture. *ACS Sustainable Chemistry & Engineering* 2016, 4 (12), 6371–6381.
 33. Espino-Pérez, E.; Bras, J.; Almeida, G.; Relkin, P.; Belgacem, N.; Plessis, C.; Domenek, S. Cellulose nanocrystal surface functionalization for the controlled sorption of water and organic vapours. *Cellulose* 2016, 23 (5), 2955-2970.
 34. Nassar, S. F.; Guinault, A.; Delpouve, N.; Divry, V.; Ducruet, V.; Sollogoub, C.; Domenek, S. Multi-scale analysis of the impact of polylactide morphology on gas barrier properties. *Polymer* 2017, 108, 163-172.
 35. Salazar, R.; Domenek, S.; Plessis, C.; Ducruet, V. Quantitative determination of volatile organic compounds formed during Polylactide processing by MHS-SPME. *Polym. Degrad. Stab.* 2017, 136, 80-88.
 36. Crouvisier-Urien, K.; Tachon, A.; Lauquin, C.; Winckler, P.; Domenek, S.; Debeaufort, F.; Karbowiak, T. Impact of the homogenization process on the structure and antioxidant properties of chitosan-lignin composite films. *Food Chem.* 2017, 236, 120-126.
 37. Diot-Neant, F.; Migeot, L.; Hollande, L.; Reano, F. A.; Domenek, S.; Allais, F., Biocatalytic Synthesis and Polymerization via ROMP of New Biobased Phenolic Monomers: A Greener Process toward Sustainable Antioxidant Polymers. *Frontiers in Chemistry* 2017, 5, (126).
 38. Espino Perez, E.; Bras, J.; Almeida, G.; Plessis, C.; Belgacem, M. N.; Perre, P.; Domenek, S., Designed cellulose nanocrystal surface properties for improving barrier properties in polylactide nanocomposites. *Carbohydrate Polymers* 2018, 183, 267-277.
 39. Fernandes Nassar, S.; Domenek, S.; Guinault, A.; Stoclet, G.; Delpouve, N.; Sollogoub, C., Structural and dynamic heterogeneity in the amorphous phase of PLLA confined at the nanoscale by co-extrusion process. *Macromolecules* 2018, 51, (1), 128-136

Patents

1. Ducruet V, Domenek S, Ruellan A, Delamour AC, Guinault A, Sollogoub C, Chollet G, Alfos C.

Book Chapters

1. Domenek, S.; Courgneau, C.; Ducruet, V. Characteristics and applications of PLA. In *Biopolymers: Biomedical and Environmental Applications*; Kalia, S.; Averous, L., Eds.; John Wiley & Scrivener Pub., 2011, p 183-223.
2. Ruellan, A., Ducruet, V. Plasticization of polylactide. In *Poly(lactic acid) Science and Technology*, Jimenez, A. ; Peltzer, M.A. ; Ruseckaite, R.A. ; Eds., RSC Publishing, 2014, 124-170
3. Ducruet, V., & Domenek, S. Characteristics and applications of poly(lactic acid) In S. Kalia & L. Averous (Eds.). *Biodegradable and Bio-based Polymers: Environmental and Biomedical Applications*. Beverly, MA Scrivener Publishing LLC, 2015, 171-224
4. Domenek S., Fernandes Nassar S, Ducruet V. Rheology, mechanical properties, and barrier properties of Poly(lactic acid). in "Synthesis, Structure and Properties of Poly(lactic acid)", Di Lorenzo ML, Androsch R, eds., *Advances in Polymer Science* 279, Springer, Switzerland, 2018, pp. 303-341