Douglas G. Hayes

Institute Professor of Biosystems Engineering
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Education

BS	Iowa State University, 1986 [Chem. Eng.]
Ph.D.	University of Michigan, 1991 [Chem. Eng.]
MBA	University of Tennessee, 2022 [Executive MBA-Strategic Leadership]

Professional Experience

1986	Research Assistant, Universal Oil Products, Inc., Des Plaines, IL
1991-1994	Research Chemist, U.S. Dept. Agriculture, Agricultural Research Service, Peoria, IL
1994-2000	Assistant Professor, Department of Chemical and Materials Engineering, University of Alabama in Huntsville, Huntsville, AL (tenured 05/00)
2000-2003	Associate Professor (tenured), Department of Chemical and Materials Engineering, University of Alabama in Huntsville, Huntsville, AL
2004-2009	Associate Professor, Department of Biosystems Engineering and Environmental Science, University of Tennessee, Knoxville, TN (tenured 7/05)
2004-2006	Adjunct Associate Professor, Department of Chemical and Materials Engineering, University of Alabama in Huntsville, Huntsville, AL
2004-present	Adjunct Associate Professor, Department of Chemical and Biomolecular Engineering, University of Tennessee, Knoxville, TN
2009-present	Professor, Department of Biosystems Engineering and Soil Science, University of Tennessee, Knoxville, TN
2014-present	UT-ORNL Joint Faculty; Visiting Faculty, Oak Ridge National Laboratory (TN; sabbatical leave 2014-2015);
2014-2019	Guest Professor, Wuhan Polytechnic University (China)
2016-present	Guest Professor, Jinan University, Guangzhou, China

Research Interests

- biopolymers and biodegradable polymers; micro and nano-plastics
- microemulsions and other complex fluids (surfactant self-assembly systems)
- enzymatic reactions in nonaqueous media
- biological, lipid, and polymer separations
- biobased products from lipids and lignocellulosics
- lipid chemistry

Recent Publications (supervisee; ** Corresponding Author*; 106 peer-reviewed journal articles, 23 book chapters, 3 co-edited books)**

1. AF Astner*, DG Hayes**, HM O'Neill, BR Evans, SV Pingali, VS Urban, TM Young, 2019, Novel Methodology to Form Micro- and Nano-Plastics from Agricultural Plastic Materials and their Dimensional, Thermal, and Chemical Characterization, *Sci Total Environ,* 685: 1097-1106, https://doi.org/10.1016/j.scitotenv.2019.06.241
2. AF Astner*, DG Hayes, SV Pingali, HM O'Neill, KC Littrell, BR Evans, VS Urban, 2020, Effects of Soil Particulates and Convective Transport on Dispersion and Aggregation of Nanoplastics via Small-Angle Neutron Scattering (SANS) and Ultra SANS (USANS), *PLOS ONE*, 15(7), e0235893, https://doi.org/10.1371/journal.pone.0235893 *(Special Issue: Plastics in the Environment)*
3. MB Anunciado*, LC Wadsworth, DG Hayes**, M English, SM Schaeffer, HY Sintim, M Flury, 2021, Impact of Agricultural Weathering on Physicochemical Properties of Biodegradable Plastic Mulch Films: Comparison of Two Diverse Climates Over Four Successive Years, *J Polym Environ* 29:1–16, https://doi.org/10.1007/s10924-020-01853-1
4. VK Sharma**, DG Hayes, VS Urban, HM O'Neill, M Tyagi, E Mamontov, 2021, Melittin exerts opposing effects on short- and long-range dynamics in bicontinuous microemulsions, *J. Colloid Interface Sci.*, 590: 94-102, https://doi.org/10.1016/j.jcis.2021.01.032
5. MB Anunciado*, DG Hayes**, AF Astner*, LC Wadsworth, DB Cowan-Banker*, J Liquet y Gonzalez, JM DeBruyn, 2021, Effect of Environmental Weathering on Biodegradation of Biodegradable Plastic Mulch Films under Ambient Soil and Composting Conditions, *J. Polym. Environ*, 29, 2916–2931, https://doi.org/10.1007/s10924-021-02088-4
6. DG Hayes**, DB Anunciado, R Ye*, RN Dunlap*, HM O'Neill, S. Pingali, VS Urban, 2021, Incorporation of Membrane-Associated Proteins Into Bicontinuous Microemulsions Through Winsor-III System-Based Extraction, *J Surfact Deterg 2*4:649–660, https://doi.org/10.1002/jsde.12500 *(Special Issue: MJ Rosen)*
7. DG Hayes**, 2021, End-of-Life Strategies for Agricultural Mulch Films, *Curr Opin Chem Eng*, 33: 100695, https://doi.org/10.1016/j.coche.2021.100695 *(Special Issue: Energy, Environment & Sustainability: Plastics in The Environment)*
8. MB Anunciado*, LC Wadsworth, J Moore, S Ghimire, AL Wszelaki, C Miles, DG Hayes**, 2021, Degradation of soil-biodegradable mulch films during storage and its impact on specialty crop production. *HortTechnol*, 31 (6), 798-809, https://doi.org/10.21273/HORTTECH04922-21
9. AF Astner*, DG Hayes**, HM O'Neill, BR Evans, VS Urban, TM Young, 2022. Forming micro- and nano-plastics from agricultural plastic films for employment in fundamental research studies, *J Vis Exp.*, 185, e64112, https://doi.org/10.3791/64112
10. DG Hayes**, M Williams, N Pechacek, B Hebert, K Stanton**, 2022, Precise Measurement of 1,4-Dioxane Concentration in Cleaning Products: A Review of the Current State-of-the-Art, *J Surfact Deterg* 25 (6), 729-741, https://doi.org/10.1002/jsde.12633

11. MA Oehler*, DG Hayes**, DH D'Souza, M Senanayake, V Gurumoorthy, SV Pingali, HM O'Neill, W Bras, VS Urban, 2022, Assessment of antimicrobial activity of melittin encapsulated in bicontinuous microemulsions prepared using renewable oils, *J Surfact Deterg*, in press *(Special Issue to commemorate D Sabatini and J Harwell)*
12. *Biobased Surfactants: Synthesis, Properties, and Applications (2nd Ed.)*, DG Hayes, DKY Solaiman, RD Ashby, Eds, Elsevier Press, 2019, ISBN 9780128127056
13. DG Hayes**, MB Anunciado*, JM DeBruyn, S Bandopadhyay, SM Schaeffer, M English, S Ghimire, C Miles, M Flury, HY Sintim, 2019, Biodegradable Plastic Mulch Films for Sustainable Specialty Crop Production, in Polymers for Agri-Food Applications, TJ Gutierrez, ed. Berlin, Springer Nature, (pp. 183-213, https://doi.org/10.1007/978-3-030-19416-1; ISBN: 978-3-030-19415-4
14. DG Hayes**, 2021, Oils and their use beyond the food industry, in Oil and oilseed processing: Opportunities and challenges, T Lafarga, G Bobo, I Aguiló, eds, Wiley, pp. 119-148, https://doi.org/10.1002/9781119575313.ch7 .

Recent Honors and Awards

- Scholarship for the UT Executive MBA-Strategic Leadership program (2022)
- Charles E. Wharton Institute Professor Award, UT Institute of Agriculture (2021)
- Fellow of the American Oil Chemists' Society (05/21)
- Outstanding Research Faculty Award, (BESS Department, UT), 04/21
- Outstanding Contribution Award, *Science and Technology of Cereals, Oils, and Foods (2/21)*
- Journal cover for *Journal of Physical Chemistry C* (2019) Vol 123, Issue 17
- John J. and Dorothy G. McDow Faculty Excellence Award (BESS Department, UT), 04/2019
- Gamma Delta Sigma Team Award (with A. Wszelaki, J. DeBruyn, M. Velandia, S. Schaeffer, L. Wadsworth, A. Saxton, J. Moore, S. Schexnayder and J. Fly, S. Bandopadhyay, M. English and M. Anunciado), UT Institute of Agriculture, 04/2019.
- University of Tennessee AgResearch Research Impact Award, 2017

Service

- Editor-in-Chief, *Journal of Surfactants and Detergents*, 2020-present
- Editorial Board, *Journal of Oil Palm Research*, 2014-present
- Editorial Board, *Grain & Oil Science and Technology*, 2020-present
- Editorial Board, *Agriculture*, 2023-present
- Editorial Board, *Science and Technology of Cereals, Oils, and Foods*, 1/2020-8/2022
- Governing Board (Member-at-Large), AOCS, 5/17-4/21