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Website: <http://biodegradablemulch.org>

#### Education:

PhD: **Univ Michigan (Chemical Engineering)** MS: **Univ Michigan (Chemical Engineering)** BS: **Iowa State University (Chemical Engineering)**

#### General Areas of Expertise:

Biobased and biodegradable polymers and other products; microemulsions and other surfactant self-assembly systems; enzymatic reactions in nonaqueous media; biological, lipid, and polymer separations; lipid chemistry and technology

#### Short Bio:

Douglas G. Hayes is a Professor of Biosystems Engineering at the University of Tennessee (UT). He also serves as an Adjunct Professor of Chemical and Biomolecular Engineering at UT, a Guest Professor at Wuhan Polytechnic University and Jinan University (Guangzhou, China), and is a UT-Oak Ridge National Laboratory Joint Faculty member. Doug received his BS and PhD degrees at Iowa State University (1986) and University of Michigan (1991), both in chemical engineering. He served as a postdoctoral Research Chemist at the USDA/ARS/NCAUR from 1991 to 1994, and as an Assistant and Associate Professor at the University of Alabama in Huntsville (Chemical and Materials Engineering; 1991-1994) prior to joining UT.

Dr. Hayes serves on the Governing Board, Senior Associate Editor and Associate Editor for J. Am. Oil Chem. Soc. and J. Surfactant Deterg., respectively. He recently received the Impact Award from the UT Institute of Agriculture. Dr. Hayes has over 73 publications in peer-reviewed journals, 19 book chapters, and 2-co-edited books (with an additional book in preparation).

#### Five Representative Publications:

1. D.G. Hayes, L.C. Wadsworth, H.Y. Sintim, M. Flury, M. English, S. Schaeffer, A. M. Saxton 2017. Effect of Diverse Weathering Conditions on the Physicochemical Properties of Biodegradable Plastic Mulches, *Polymer Testing* 62 (2017) 454-467.
2. M. Brodhagen, J. Goldberger, D.G. Hayes, D.A. Inglis, T. Marsh, C. Miles, 2017. Policy Considerations for Limiting Unintended Residual Plastic in Agricultural Soils, *Environmental Science and Policy*, 69: 81-84.
3. D.G. Hayes, R. Ye, R.N. Dunlap, M. J. Cuneo, S.V. Pingali, H.M. O'Neill, V.S. Urban, 2017. Protein Extraction into the Bicontinuous Microemulsion Phase of a Water/SDS/Pentanol/Dodecane Winsor-III System: Effect on Nanostructure and Protein Conformation, *Colloids and Surfaces B: Biointerfaces*, in press (doi:10.1016/j.colsurfb.2017.09.005)
4. V. K. Sharma, Douglas G. Hayes, Volker S. Urban, Hugh M. O'Neill, M. Tyagi and E. Mamontov, 2017. Nanoscopic dynamics of bicontinuous microemulsions: effect of membrane associated protein, *Soft Matter*, 13, 4871-4880.
5. 72. D.G. Hayes, R. Ye, R.N. Dunlap, S.V. Pingali, H.M. O'Neill, V.S. Urban, 2017. Bicontinuous Microemulsions as a Biomembrane Mimetic System, *Biochimica et Biophysica Acta: Biomembranes*, in press.

#### FEWSTERN Symposium 2017 Presentation Title and Abstract:

I indicated that I would be happy to give a presentation, but have not heard any confirmation from the organizers. If selected:

Life Cycle of Biodegradable Plastic Mulches for Specialty Crop Production: Impact on Water Conservation and Microplastics Formation

Use of thin plastic film as mulch is standard practice for specialty crop growers throughout the U.S. to increase yields, prevent weeds and conserve water and soil. Unfortunately, most plastic mulch after its use is stockpiled or burned due to limited recycling and landfill options, releasing harmful residues such as microplastics into the environment. Biodegradable plastic mulches serve as a potentially more sustainable alternative to polyethylene mulches, since they can be tilled into the soil after harvest (thereby eliminating labor costs for the retrieval and disposal of mulch), where they will undergo biodegradation. However, widespread adoption of biodegradable mulch by farmers has been hindered due to higher purchase costs, lack of knowledge, perceived or observed deterioration during use, and slow or incomplete biodegradation after soil incorporation. This presentation will provide an overview of a 5-year interdisciplinary research project funded by the USDA-Specialty Crops Research Initiative program that involves over 20 investigators from the University of Tennessee, Washington State University, and Montana State University (<http://biodegradablemulch.org>) and results from my laboratory pertaining to changes in physicochemical properties of plastic mulches due to environmental weathering, effect of weathering on biodegradability of plastic mulches, and formation of terrestrial micro- and nano-plastics from mulches.