

2022 AOCS Annual Meeting & Expo

Industrial Oil Products Program

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Biofuels I

INDUSTRIAL OIL PRODUCTS

Joint session with the Processing Division

Sponsored by Desmet Ballestra North America, Inc.

Chairs: Bruce Patsey, Oil-Dri Corp of America, USA; and Robert O. Dunn, Jr., USDA ARS NCAUR, USA

Monday, May 2, 2022 | 9:55 a.m.–Noon EDT (Atlanta, USA; UTC-4)

The first Biofuels session includes these topics: the pretreatment of HVO feedstocks; developments in enzymatic production of biodiesel; novel process to enhance biodiesel production from PFAD; innovations in soybean oil pretreatment; and new HCU pretreatment units.

Scale up biodiesel production from palm fatty acid distillate at palm oil refining plant. Teerasak Punvichai^{*1,2}, ¹*Faculty of Innovative Agriculture and Fisheries Establishment Project/Integrated High-Value Oleochemical Research Center, Prince of Songkla University, Thailand;* ²*Faculty of Science and Industrial Technology, Prince of Songkla University, Thailand*

Renewable diesel pretreatment: Focus on soybean oil. Patrick Harrington*, *Crown Iron Works Co, United States*

New developments in enzymatic biodiesel. Rasmus B. Hansen*, Per M. Nielsen, *Oils & Fats R&D, Novozymes AS, Denmark*

Requirements and solutions for the pretreatment of HVO feedstocks. Wim de Greyt*, *Desmet Ballestra, Belgium*

Updates on hydrothermal cleanup (HCU) pretreat. Jocelyn Goodwin*, *Better Fuels Group, Applied Research Associates, United States*

Green Chemistry and Oleochemicals I

INDUSTRIAL OIL PRODUCTS

Chairs: Helen Ngo, USDA ARS ERRC, USA; and Majher Sarker, USDA, USA

Monday, May 2, 2022 | 1:25–3:30 p.m. EDT (Atlanta, USA; UTC-4)

The Green Chemistry and Oleochemicals sessions cover topics such as chemically modified animal fats; biosurfactants and ecolabels; soluble soybean polysaccharide film; green engineering in process assessment; bio-derived epoxy-amine formulations; potential of birch bark extracts; p-cymene applications; estolides; corrosivity of biofeedstocks; utilization of soapstock; and environmentally acceptable lubricants.

Innovations in high performance, environmentally acceptable lubricants (EALs) in lubricant applications. Mark Miller*, Biosynthetic Technologies, United States

Serendipitous production of industrially useful p-cymene by catalytic dehydration and isomerization of perillyl alcohol. Bryan R. Moser*¹, Michael A. Jackson², Kenneth M. Doll¹, ¹Bio-Oils Research Unit, USDA ARS NCAUR, United States; ²Renewable Product Technology Research Unit, USDA ARS NCAUR, United States

Investigation of the physical and tribological properties of alkyl-branched chicken fat. Majher I. Sarker*¹, Hailemichael Yosief², Grigor Bantchev³, Robert Dunn², Steven Cermak², ¹Sustainable Biofuel and Co-Product Research Unit, USDA, United States; ²USDA, United States; ³NCAUR, USDA/ARS, United States

Quantifying corrosive behavior of triacylglycerol feedstocks under elevated temperature and pressure. Deborah Liu*, Nathan Levandovsky, Soheil Daryadel, Samyukta Shrivastav, Jiahui Li, Zhiheng Lyu, Qian Chen, Jessica Krogstad, Daniel Krogstad, University of Illinois, United States

Sustainability aspects of the production and life stages of surfactants. Douglas Hayes*, Biosystems Engineering and Soil Science, University of Tennessee, United States

Green engineering approach with microstructured coiled flow inverter for CMF and HMF continuous flow synthesis. Frank Schael*¹, Patrick Rojahn¹, Krishna Nigam², ¹Department of Chemical Engineering and Biotechnology, Hochschule Darmstadt University of Applied Science, Germany; ²Department of Chemical Engineering, Indian Institute of Technology Delhi, India

New Uses of Glycerine

INDUSTRIAL OIL PRODUCTS

Chairs: Franck Dumeignil, University of Lille, France; and Dharma Kodali, University of Minnesota, USA

Monday, May 2, 2022 | 3:55–6 p.m. EDT (Atlanta, USA; UTC-4)

The New Uses of Glycerine session includes the topics of electro-oxidation of glycerol; N-monoallyl anilines; Ca-hydroxyapatites as glycerol polymerization catalysts; and process design for glyceric acid.

Electro-oxidation of glycerol and diglycerol in the presence of Pt or Pd-based electrocatalyst follows by the reductive amination of the products obtained. Bitty Serge Roméo Kouamé, Karine De Oliveira Vigier*, Stève Baranton, Christophe Coutanceau, IC2MP, Université de Poitiers, CNRS, France

Process design for efficient production from glycerol into high-value chemicals. Tsutomu Chida*¹ (*Industrial Oil Products Division Student Award Winner*), Kousuke Hiromori¹, Naomi Shibasaki-

Kitakawa¹, Naoki Mimura², Aritomo Yamaguchi², Atsushi Takahashi¹, ¹*Tohoku University, Japan*;
²*National Institute of Advanced Industrial Science and Technology (AIST), Japan*

Glycerol polymerization over stable and selective calcium hydroxyapatite. Negissa Ebadi Pour¹,
Sébastien Paul¹, Benjamin Katryniok¹, Franck Dumeignil*², ¹*Centrale Lille Institut, France*; ²*Univ. Lille, France*

Selective monoallylation of anilines to form fine chemicals using allyl alcohol derived from glycerol.
Yoshihiro Kon*, *Interdisciplinary Research Center for Catalytic Chemistry, AIST, Japan*

Panel discussion

Biorenewable Polymers

INDUSTRIAL OIL PRODUCTS

Joint session with the Biotechnology Division

Chairs: Eric Cochran, Iowa State University, USA; and Richard Ashby, USDA ARS ERRC, USA

Tuesday, May 3, 2022 | 7:05–9:30 a.m. EDT (Atlanta, USA; UTC-4)

The Biorenewable Polymers session features talks covering environmentally friendly coating products using soybean oil; synthesizing monomers with fatty acids; renewable lipid-based micelle nanoparticles as amphiphilic drug carriers; photoinduced reactions to produce composites from biobased monomers; extending the lifespan of roofing shingles with soybean oil-based polymeric coatings; industrial uses of cashew nutshell liquid; epoxy resins made from epoxidized algal, soybean, and linseed oils.

Cashew NutSell Liquid (CNSL), a promising source of biobased additives and building blocks for the industry. Benoit Briou*, Audrey Roy, Lucas Jégo, Adélaïde Gartili; *R&D, Orpia Innovation/ICGM, France*

Plant oil based radically polymerizable monomers for sustainable polymers. Sylvain Caillol*, *ICGM, France*

Epoxy materials with triglyceride structure. Zoran S. Petrovic*, Jian Hong, Dragana Radojic, *Kansas Polymer Research Center, Pittsburg State University, United States*

Bio-based cationic waterborne polyurethane dispersions from high oleic soybean oil. Jasna Djonlagic*, Milica Lovric Vukovic, Jian Hong, Zoran S. Petrovic, *Kansas Polymer Research Center, Pittsburg State University, United States*

Biobased composites from renewable monomers and cellulosic reinforcements by photoinduced processes. Sara Dalle Vacche*, *Department of Applied Science and Technology, Politecnico di Torino, Italy*

Soybean oil-based polymeric coatings for the rejuvenation of old asphalt shingles. Nacu B. Hernandez*, Andrew Becker, Michael Forrester, Eric Cochran, *Chemical and Biological Engineering, Iowa State University, United States*

Lipid derived block copolymers as amphiphilic nanocarriers for targeted delivery. Aman Ullah*, Huiqi Wang, Rehan Pradhan, *AFNS, University of Alberta, Canada*

Green Chemistry and Oleochemicals II

INDUSTRIAL OIL PRODUCTS

Chairs: Helen Ngo, USDA ARS ERRC, USA; and Majher Sarker, USDA, USA

Tuesday, May 3, 2022 | 9:55–Noon EDT (Atlanta, USA; UTC-4)

The Green Chemistry and Oleochemicals sessions cover topics such as chemically modified animal fats; biosurfactants and ecolabels; soluble soybean polysaccharide film; green engineering in process assessment; bio-derived epoxy-amine formulations; potential of birch bark extracts; p-cymene applications; estolides; corrosivity of biofeedstocks; utilization of soapstock; and environmentally acceptable lubricants.

Heat sealable soluble soybean polysaccharide based composite films containing gelatin and curcumin for oil packaging. Jie Liu^{*1}, Yitong Dong², Xuejing Zheng², Keyong Tang², ¹*School of Materials Science and Engineering, Zhengzhou University, China (People's Republic);* ²*Zhengzhou University, China (People's Republic)*

Evaluation of hybridized bio-based building blocks as coating materials. Emre Kinaci^{*}, Sarah Salazar, Giuseppe Palmese, Joseph Stanzione, *Rowan University, United States*

Converting birch bark extracts into bio-based thermosets. Joseph Stanzione^{*}, John Chea, Kylie Howard, Kirti Yenkie, *Rowan University, United States*

Correlating viscosity of 2-ethylhexyl oleic estolide esters to their molecular weight. Grigor Bantchev^{*1}, Steven Cermak²; ¹*NCAUR, USDA/ARS, United States;* ²*USDA, United States*

Proposal of complete utilization system of soapstock by electrolysis. Kousuke Hiromori^{*}, Keisuke Katagami, Atsushi Takahashi, Naomi Shibasaki-Kitakawa, *Tohoku University, Japan*

Enzyme developments in oleochemicals and surfactants. Martin Rushworth^{*}, Hon Seng Yee, *Novozymes Malaysia, Malaysia*

General Industrial Oil Products

INDUSTRIAL OIL PRODUCTS

Chairs: Darrell Sparks, Mississippi State University, USA; and B.K. Sharma, USDA ARS ERRC, USA

Tuesday, May 3, 2022 | 9:55–Noon EDT (Atlanta, USA; UTC-4)

Advancing PCMO (passenger car motor oil) with sustainable high oleic soybean base oil. Mark Miller^{*1}, Matthew Kriech², ¹*Biosynthetic Technologies, United States;* ²*Innoleo LLC, United States*

Oil produced from Ghana cocoa bean for potential industrial applications. Samuel K. Tulashie¹, Daniel Doodoo^{*2} (**Industrial Oil Products Division Junior Researcher Travel Grant Winner**), Godfred Appiah³, Francis Kotoka⁴, Kingsley Enoch Adukpoh⁵, ¹*Industrial Chemistry Section, Department of Chemistry; University of Cape Coast, Ghana;* ²*Department of Chemistry, Aix-Marseille University, Ghana;* ³*Department of Water Supply, Sanitation and Environmental Engineering, IHE Delft Institute of Water Education, Czech Republic;* ⁴*Department of Green Chemistry and Technology, Ghent University, Belgium;* ⁵*Chemistry, Kwame Nkrumah University of Science and Technology, Ghana*

Innovations in high performance, environmentally acceptable lubricants (EALs) in lubricant applications. Mark Miller^{*}, *Biosynthetic Technologies, United States*

Eutectic solvent as co-solvent for oil extraction from plant seeds. Adeeb Hayyan^{*} (**Industrial Oil Products Division Junior Researcher Travel Grant Winner**), *Department of Chemical Engineering, University of Malaya, Malaysia*

Membrane-based oil and biodiesel washing. N. Kocherginsky^{*}, *UIUC, United States*

Energy conservation in solvent extraction plants of oilseeds. Sadru H. Dada*, *Consultancy, Self Employed, United Arab Emirates*

New Crops for Oils/Feedstock Engineering

INDUSTRIAL OIL PRODUCTS

Joint session with the Biotechnology Division

Chairs: Roque Evangelista, USDA ARS NCAUR, USA; and Mahesh Balwant Khot, Farmsow Pvt. Ltd., India

Tuesday, May 3, 2022 | 1:25–3:30 p.m. EDT (Atlanta, USA; UTC-4)

New Crops for Oils/Feedstock Engineering topics includes metabolic engineering of oilseeds; potential of Chrysophyllum albidium seed; pennycress as cover crop and source of food and oil; and the applications and potential of Camelina sativa and Carinata.

Carinata: An emerging biofuel feedstock platform. Rick Bennett*, *Nuseed, Canada*

Camelina breeding and development—A Canadian perspective. Christina Eynck*, *Specialty Crop Breeding, AAFC, Canada*

CoverCress—A novel oilseed winter crop with canola-like composition that helps sequester carbon and prevent soil erosion. Tim Ulmasov*, *CoverCress Inc., United States*

Targeted genome editing of industrial oilseed crops to enhance synthesis of functional lipids. Linah Alkotami*¹, Maliheh Esfahanian², Brice Jarvis³, Kathleen M. Schuler⁴, Jianhui Zhang⁵, Somnath Koley⁶, Doug K. Allen⁷, Chaofu Lu⁸, John Sedbrook⁹, Timothy Durrett¹, ¹*Biochemistry and Molecular Biophysics, Kansas State University, United States;* ²*Plant Biology, Carnegie Institution for Science, United States;* ³*Illinois State University, United States;* ⁴*Biochemistry, Kansas State University, United States;* ⁵*Plant Sciences & Plant Pathology Department, Montana State University, United States;* ⁶*Donald Danforth Plant Science Center, United States;* ⁷*Agricultural Research Service, U.S. Department of Agriculture/Donald Danforth Plant Science Center, United State;* ⁸*Montana State University, United States;* ⁹*Biological Sciences, Illinois State University, United States*

Development of dedicated non-food oil crops for industrial oil production through metabolic engineering. Xueyuan Li, Emelie Ivarson, Li-Hua Zhu*, *Swedish University of Agricultural Sciences, Lomma, Sweden*

Viability of utilization of *Chrysophyllum albidium* seed oil as bio-industrial fluid. Chinedu M. Agu*¹, Goziya W. Dzarma¹, Albert C. Agulanna², Emeka L. Udokporo², ¹*Chemical Engineering, Michael Okpara University of Agriculture, Nigeria;* ²*Centre for Environmental Management and Control, University of Nigeria, Enugu Campus, Nigeria*

Biofuels II

INDUSTRIAL OIL PRODUCTS

Joint session with the Processing Division

Sponsored by Desmet Ballestra North America, Inc.

Chairs: Bruce Patsey, Oil-Dri Corp of America, USA; and Robert O. Dunn, Jr., USDA ARS NCAUR, USA

Wednesday, May 4, 2022 | 9:55 a.m.–Noon EDT (Atlanta, USA; UTC-4)

The second Biofuels session includes fractionation by urea inclusion; a solution for measuring oil content; and silica adsorbents.

Fractionation of biodiesel by urea inclusion to improve its cold flow properties and provide feedstocks for chemicals/polymers production. Junli Liu*, Bernie Tao, *Agricultural and Biological Engineering, Purdue University, United States*

Filter media options in renewable fuels and edible oils. Zachary Galberd*, Eric Appelbaum, *Dicalite Management Group, Inc., United States*

Adsorptive reduction of metals and phospholipids from biofuel feedstocks. Neal Williams*¹, David Gittins², Tony Smith², ¹*Science and Technology, Imerys, United States*; ²*Imerys, United States*

Silica adsorbents for biofuel feedstock pretreatment. Chelsea Grimes*, *Biofuels and Edible Oils, W. R. Grace & Co., United States*

Industrial Oil Products Poster Session

Chair: Jerry King, *R&D Consulting, USA*

IOP-01 The effect of structure regularity of natural oils on properties of oil-based epoxy resins. Jian Hong*, Dragana Radojic, Zoran S. Petrovic, *Kansas Polymer Research Center, Pittsburg State University, United States*

IOP-02 Crystallography and functionality of natural waxes: Insights for the development of tailored lipid materials. Francisco Leyva Gutierrez*, Tong (Toni) Wang, *Department of Food Science, University of Tennessee Knoxville, United States*

IOP-03 Flame retardant polyurethane foams using vegetable oil-based polyol. Prashant Kote*, Magdalen Asare, Sahilkumar Chaudhary, Tim Dawsey, Ram Gupta, *Pittsburg State University, United States*

IOP-04 Production of branched esters via continuous alkylation of fatty acid methyl esters over montmorillonite and H-ZSM5 catalysts. Evan Davison*¹, Jessica Otto¹, Sandeep Kumar², Randy Maglinao¹, ¹*Montana State University-Northern, United States*; ²*Department of Civil & Environmental Engineering, Old Dominion University, United States*

IOP-05 Study of the phenolic fraction for the valorization of olive pomace as a functional ingredient. Ilaria Grigoletto¹, Patricia García Salas², Enrico Valli*³, Alessandra Bendini⁴, Federica Pasini¹, Sebastián Sánchez Villasclaras⁵, Roberto García Ruiz⁶, Tullia Gallina Toschi¹, ¹*Department of Agricultural and Food Sciences, Alma Mater Studiorum—University of Bologna, Italy*; ²*University of Bologna, Italy*; ³*Department of Agricultural and Food Sciences and Interdepartmental Centre of Agri-Food Industrial Research, Alma Mater Studiorum—Università di Bologna, Italy*; ⁴*DISTAL, Alma Mater Studiorum Università di Bologna, Italy*, ⁵*Chemical, Environmental and Materials Engineering, University of Jaen, Spain*; ⁷*Plant and animal biology and ecology, University of Jaén, Spain*; ⁸*Department of Food and Agriculture Sciences, University of Bologna, Italy*

IOP-06 Synthesis of cycloalkanes from lignocellulosic platform. Jessica Otto*, Evan Davison, Randy Maglinao, *Montana State University-Northern, United States*