Sponsored by PURE MICHIGAN® Michigan Economic Development Corporation

Scholarship Awards

Announcing the Winners of 2014-2015 SPE® ACCE Scholarships Sponsored by Michigan Economic Development Corp.

A remarkable group of graduate students with international academic or work experience was selected for this year's ***SPE ACCE Scholarship Awards*** for the 2014-2015 academic year. The scholarship were graciously sponsored by Michigan Economic Development Corp. (Lansing, Michigan). Winning students whose composites-intensive projects were judged to have the greatest potential impact on ground transportation were Markus Downey of Michigan State University, Fatimat Oluwatoyin Bakare of University of Borås, and Sebastian Goris of University of Wisconsin-Madison. Each student will receive a total scholarship of $2,000 USD and will return to present the results of his or her research at next year's SPE ACCE show, September 9-11, 2015.

Markus Downey, who is working on a Ph.D. degree in Chemical Engineering at Michigan State University (East Lansing, Mich.), won the scholarship for a student enrolled in a Michigan institute of higher learning with the topic: *Hybrid Toughening of Aromatic Epoxy Polymers via Graphene Nano-Platelets and Aliphatic Epoxy Copolymers: Optimized Fiber-Reinforced Polymer Composites for Lightweighting.* Explaining how his work is applicable to ground transportation Downey says, "Fiber-reinforced polymer composites will play a significant role in the lightweighting strategies required to meet the new U.S. Corporate Average Fuel Economy (CAFE) standards. My proposed research will look at hybrid-toughening of fiber-reinforced polymer composites by toughening the fiber/matrix interface with aliphatic epoxy co-polymers alone or in conjunction with graphene nanoplatelets as well as toughening the bulk matrix with low concentrations of aliphatic epoxy co-polymers – two typical areas of failure in fiber-reinforced polymer composites. Through targeted improvements of both the sizing (coating) on the reinforcing fibers and the surrounding polymer matrix, the energy required to propagate cracks in each of these areas should be increased to yield a substantially toughened composite. This, in turn, can help reduce the amount of material needed for a given application, leading to weight and cost savings, or it can possibly broaden usage in new areas of the vehicle, particularly if the composite shows mechanical properties not previously attained."

Downey earned a B.A. degree in German and a B.S. degree in Chemical Engineering, both from the University of Rhode Island (URI, Kingston, R.I.) in 2002 as part of the school's International Engineering Program (a five-year dual-degree program). After completing his undergraduate education, Downey stayed at URI and worked on fatigue life improvement of thermal spray instrumentation and thermal barrier coatings as part of his M.S. degree in Chemical Engineering, which he was awarded in 2004. After graduating, Downey spent eight years working in the exhaust gas after-treatment industry, the first two years of it in Germany with Emitec GmbH as a research engineer. Coming to Michigan to work as a technical applications engineer for Emitec Inc., Downey successfully expanded the large-engine and locomotive business of the company. Now a full-time student starting the third-year of his Ph.D. studies in Chemical Engineering at Michigan State University, Downey works in the Composite Materials and Structures Center where his focus is on toughening fiber-reinforced polymer composites and polymer nanocomposites for high-performance applications. He has published several papers in conference proceedings and has give presentations at technical conferences in the U.S. and China. He also is a U.S. patent holder.

Originally from Nigeria and currently working on her Ph.D. degree in Materials Science/Polymer Engineering at the Swedish Centre for Resource Recovery at the University of Borås (Borås, Sweden), Fatimat Oluwatoyin Bakare won a scholarship for her proposal on *Synthesis of Bio-Based Composites with a Lactic Acid Based Thermoset Resin from Lactic Acid and Allyl Alcohol.* Explaining how this work is important for the transportation industry Bakare says, "There have been increased interests in the use of biomass and its derivatives to provide alternatives to fossil fuel resources to reduce environmental risks and improve global sustainability. Biomass and its derivatives can be used in the production of polymer and composite materials, leading to weight loss and gains in fuel efficiency. We have previously reported synthesis of a thermosetting bio-based resin prepared by direct condensation of pentaerythritol, itaconic acid, and lactic acid. This resin had relatively good mechanical properties, but its relatively high viscosity caused poor wetout and impregnation of reinforcements, leading to lowered mechanical performance. Hence, a new resin with lower viscosity that would provide better impregnation of reinforcements is needed. The goal of my new research is to investigate the technical feasibility of a resin based on lactic acid and allyl alcohol combined with natural fiber reinforcement."

Bakare has been a lecturer at Lagos State University (Lagos, Nigeria), in the Department of Chemical and Polymer Engineering since 2009, where she earned her B.S. degree in Chemical and Polymer Engineering in 2004 with honors. She studied Industrial and Production Engineering at University of Ibadan (Ibadan, Oyo, Nigeria) in 2006 and graduated in 2008 with an M.S. degree. She currently is a postgraduate student at University of Borås working towards her Ph.D. degree under the supervision of Prof. Mikael Skrifvars and co-supervisor, Dr. Dan Åkesson. Bakare has taught at the collegiate as well as high school level, sat on many academic committees (including community service work), and supervised exam projects. She also has worked as an industrial attaché and laboratory technologist for a quality-control laboratory supporting the textile industry. She has had two journal articles published, and has three more awaiting publication. Papers she has authored or co-authored also have been featured in five different technical conferences to date. And she has five times been a scientific journal referee for the *Journal of Applied Polymer Science*. Bakare is a past vice-president of the student chapter of the Nigerian Society of Chemical Engineers and Polymer Institute of Nigeria. She speaks English, Yoruba, and some Swedish.

Originally from Germany, Sebastian Goris is working on a doctorate in Mechanical Engineering at University of Wisconsin-Madison (UWM, Madison, Wisc.) and won the third graduate scholarship this year with a research project entitled *Contribution to the Understanding of Fiber Motion in Compression Molding of Long-Fiber Thermoplastics*. Explaining the significance of his topic Goris says, "Compression molding of long fiber-reinforced thermoplastics (LFT) composites is a widely used process to produce semi-structural parts with a desirable balance of low weight, good mechanicals, and cost-efficient manufacturing. However, the final state of the fibers greatly impacts the local and global properties of the finished part and has to be carefully considered, although currently there is no software tool able to predict fiber-matrix separation and fiber dispersion within a molded part. In our group, a mechanistic model has been developed that represents each fiber as a chain of interconnected segments and takes into account excluded volume forces, drag forces, fiber-fiber interactions, and fiber elasticity. For my research, I will introduce this model for an extensive study on fiber attrition, fiber dispersion, and fiber-matrix separation in LFT compression molding. Simulation results will be verified to aid in the understanding of fiber-fiber and fiber-matrix interactions. A more accurate prediction of the anisotropy and heterogeneity within compression-molded LFT parts will provide the foundation for reliable structural analysis and hence improved automotive part design."

Goris holds a B.S. degree from the Department of Mechanical Engineering at RWTH Aachen University (Aachen, North Rhine-Westphalia, Germany). While completing his undergraduate degree, he focused on polymer processing and worked as an undergraduate research assistant at the Institute of Plastics Processing (IKV) at Aachen University. In 2012, he received a full one-year scholarship from the German Academic Exchange Service (DAAD) to attend graduate school at UWM where, under the direction of Prof. Tim Osswald at the Polymer Engineering Center, Goris completed his M.S. degree in Mechanical Engineering and now is working towards a Ph.D. degree. Papers Goris has either authored or co-authored already have been published in four conference proceedings and a chapter on *Composites Manufacturing Processes* for the Mechanical Engineering Handbook, 3rd edition, is currently under revision. His work has been featured on posters and presentations given at conferences in the U.S., Germany, and Israel. He will be a conference reviewer at the 3rd Young Investigators Conference and the 6th German Association of Computational Mechanics in Germany next year. He was honored with an Academic Achievement Award from the Division of International Studies and International Services at UWM this year, and last year Goris received a second-place award in the Ratner Award Competition for course project in Engineering Management of Continuous Process Improvement at UWM. In 2013 he also attended a Wisconsin Entrepreneurial Bootcamp (WEB) at the Wisconsin School of Business. While still at Aachen University, Goris was a mentor for international students in the BeBuddy project and during his first year at UWM, he was a volunteer ambassador for Aachen University. He has been a member of SPE since 2012. After graduation, he plans to work in the automotive industry working on developments in polymer and composite processes.