

## Dr. Shamshina's Biography

All Dr. Shamshina's work from the time of graduation until now has been directed towards commercialization of findings conceived by academia into private sector. After gaining relevant experience during her PhD and postdoctoral studies at The University of Alabama (UA), Dr. Shamshina joined Streamline Automation, LLC (Huntsville, AL) in 2010, where she was working on development and commercialization of advanced technologies for the aerospace and defense markets, the research supported by leading U.S. governmental agencies, such as the US Air Force, Army, and NASA. (In 2011, she received NASA Tech Brief Award "Ionic Liquids: Unlocking the Gate to Replacing Hydrazine," DRC 010-041, March 21, 2011).

In 2012, Dr. Shamshina joined the UA start-up company 525 Solutions, Inc., as a CTO, where she has extensive experience in developing a company's technological backbone 'from the ground up', directing the strategic design, management, data acquisition, and implementation of technology infrastructure, at the same time providing technical leadership and ensuring the implementation of many technological solutions. Her engineering education also allowed her conducting the economic analysis, cost-benefit and cost-effectiveness analysis of new technologies.

During her stay with 525 Solutions Dr. Shamshina participated in preparation of *ca.* 70 grant proposals (27 academic and 45 small business grants) from primarily U.S. federal agencies including Department of Agriculture (USDA), Department of Defense (DOD), Department of Energy (DOE), Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), and National Science Foundation (NSF), and also from other sources (*e.g.*, Broad Agency Announcements, Strategic Environmental Research and Development Program) that resulted in \$3,000,000 of awards for academia and \$2,000,000 in awards for small businesses. She was PI or Co-Investigator on 15 applications and 6 awarded grants from the Department of Energy, Department of Energy Nuclear Energy Research Initiative, National Science Foundation, *etc.* Within 525, successful development of a UA developed technology resulted in a \$1.5M award from DOE to further scale-up the technology to a commercial stage. Dr. Shamshina was a PI on this grant, for 6 months.

In 2016 – 2017, Dr. Shamshina was employed by McGill University as an Academic Associate in Green Chemistry, in the Department of Chemistry, Faculty of Science. (While at McGill she maintained a consultant agreement with 525 Solutions, Inc. where she continued to pursue 525 technologies' development and implementation.) The nature of her assignment at McGill was focused on bridging the academic/industry environments and helping linking academic innovation with commercialization. She was responsible for building a powerful pilot-scale facility at McGill, for both internal and service-oriented research, from testing various feedstocks to biopolymers isolation to the production of materials with specific characteristics, perusing the concept for elimination of synthetic plastics. The pilot-scale facility development included design of processing equipment, choosing needed analytical instrumentation, as well as design of 'material laboratory'. Also, at McGill, Dr. Shamshina involved in educating students about Green Chemistry (green chemistry in the context of organic syntheses), supervised 'Biopolymers Team' of 6 students and postdocs, whose research was focused on the developments in the field of biopolymers, meeting with industrial companies and government representatives. She was actively

involved and participated in grant writing such as application to a grand challenge, MacArthur 100&Change (\$100M) to find a solution that would help solve a critical problem of our time, Canada Foundation for Innovation (CFI) grant (\$8M).

Dr. Shamshina's research interests focus on all aspects of ionic liquids and biopolymer processing, from overall material preparation to industrial applications, surface modification through organic synthesis, and green chemistry. She is particularly interested in potential industrial uses of ionic liquids and their use in development of technological solutions to societal challenges. In August 2017, Dr. Shamshina accepted MSL's CTO position, where she implements an R&D Group/MSL's research and development policies, objectives, and initiatives, and ensures research and development activities help maintaining an organization's competitive position. She directs overall research and development team and makes recommendations based on research findings and product performance. She's also in charge for the development of marketable, patentable concepts involving chitin, to generate intellectual property for the company. Below are only few of her skills and expertise:

- Technical Expertise. Development of new ideas, implementation of new methods, and relevant chemical expertise: synthetic methodology, purification techniques, and numerous analytical methods. Chemical engineering expertise: physical properties determination, diagram drawings, mass/heat balances, equipment scale – up, and pilot equipment.
- Technical Leadership. Ability to coordinate the efforts of a research team to ensure efficient and timely project development, supervision of personnel responsible for direct data collection, reports and reference documents.
- Business Development (both Early-Development Phase and the Implementation Phase). Start-up business model generation, business planning, commercialization plan development, business organization, execution of all necessary agreements (non-disclosure, confidentiality, operating agreements, *etc.*).
- Project Development. Applying discoveries generated during research in the laboratory to the commercially viable applications from proposal write-up, proof-of-concept demonstration, to commercialization.
- Executive and Managerial. These include strategic and operations management from organizing/planning and coordinating to controlling, financial management (budget preparation and overseeing), and human resource management.
- Finding and Negotiation with Potential Investors. Negotiations for investment with private equity venture capital (VC) firms, opportunity cost analysis, preparation for the investment process, investment models, and investment documents/term sheets.
- Experience in Collaborative Grant Writing. Academic grants, small business grants from academia, small business grants from industry, from developing the ideas to submission. In the last 5 years participated in preparation of *ca.* 70 grant proposals (27 academic and 45 small business grants) from primarily U.S. federal agencies including Department of Agriculture (USDA), Department of Defense (DOD), Department of Energy (DOE), Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), and National Science Foundation (NSF), but also from other sources (*e.g.*, Broad Agency Announcements, Strategic Environmental Research and Development Program) that resulted in \$3,000,000 of awards for academia and

\$2,000,000 in awards for small businesses. PI or co-PI on 15 applications and 6 awarded grants. Participated in application to a grand challenge, MacArthur 100&Change (\$100M) to find a solution that would help solve a critical problem of our time) and Canada Foundation for Innovation (CFI) grant (\$8M). PI on DOE Phase II \$1,500,000 SBIR grant (2017).

- Experience in Dissemination of Results. A strong record of internationally refereed scientific and technical publications (patents included), conference and meeting presentations, and briefs.
- Intellectual Property Development. Application of technical skills to assisting in IP development, including comprehensive evaluation of technology potential and screening through key criteria, market-based assessments, building suitable business cases, drafting patent applications.
- Expertise in Ionic Liquids. Specialization in ionic liquids which covers the broad area of fundamental understanding of the nature of ionic liquids, corresponding design and synthesis of different categories of ionic liquids (*e.g.* active pharmaceutical ingredients ionic liquids with potential therapeutic applications, energetic ionic liquids, agrochemical ionic liquids, ionic liquids for biomass processing, ionic liquids in polymer science including bio-polymeric materials and ionic liquids in biotechnology). Experience in applications of ionic liquids both *as* new materials and *in* the preparation of new materials for diverse new technologies and more environmentally friendly processes.
- Team Organization. Skills needed to create strong networks of collaborators, community/industry links, partnership including academic and industrial partners, and outsourcing efforts needed for demonstration of innovation.

#### **Statistics:**

1. Refereed Publications: 52
2. Books: 5
3. Citations; H-Index: > 463; 18
4. Patents and applications: 16
5. Presentations (including collaborators) before National, International and Regional Meetings: 52