



A LITTLE ABOUT RUI RESENDES

EDUCATION: PhD, chemistry with a specialty in materials, University of Toronto, 2000; B.Sc. (honours), chemistry, University of Toronto, 1996.

INTERESTS: Cycling; writing, playing and recording music; researching and cooking elaborate international dishes.

WORDS TO LIVE BY: "Those who say it can't be done should get out of the way of those who are doing it. In innovation, especially, it's so easy to say no. Those words really resonate."

GREEN CHEMISTRY

Dr. Rui Resendes' technology commercialization enterprise GreenCentre Canada sets its sights on the oilsands

By Melanie Collison

At his left shoulder, chemist and business strategist Rui Resendes has the recognized expertise of Queen's University technology transfer guru John Molloy. On his right, he has leading Canadian green chemistry innovator Philip Jessop, whose solvent and surfactant technology promises to slash the environmental impact of oilsands development.

Resendes is overseeing the chemical reaction between them in hopes of seeing explosive success driving the chemical technology sector once again in Canada.

"We used to be one of the global leaders in chemical technology, bringing the newest and most innovative technologies to market," he says. "That dried up through the agglomeration of big companies into giant companies, with the headquarters taken out of Canada. Nova Chemicals is the latest casualty. It frustrates me because innovations should be feeding and sustaining a very healthy manufacturing sector. We need more chemical sector RIMs [Research In Motions], more giants."

But with a difference, he adds. "The chemical sector, at \$3 trillion, is the world's largest manufacturing sector. We have an opportunity to take that onto a green level—to reinvent the sector. The discovery base is there."

Resendes, 38, is the executive director of GreenCentre Canada, an offshoot of the technology transfer incubator at Queen's, PARTEQ Innovations, where Molloy is president and chief executive officer.

As well as holding the Canada Research Chair in Green Chemistry at Queen's, Jessop is GreenCentre's technical director.

"I see myself as a fortunate student in finding opportunities to build [their inputs] into what we have here today," Resendes says.

"This helps satisfy my frustration, to do something with all these great ideas."

With a PhD in polymers in his pocket followed by seven years as a research chemist at Bayer Inc. and in business development at Bayer's technical transfer unit, LANXESS Inc., Resendes was weary of seeing Canadian innovations brought to market under foreign ownership. In 2007, when he was offered the position of PARTEQ's director of commercial development, chemistry and materials, he leapt at it.

Mentored by Molloy and inspired by Jessop's passion for green chemistry, Resendes shaped the GreenCentre Canada model and by 2009 had funding from the federal government and the province of Ontario. GreenCentre's clients are research institutions across Canada looking to advance technologies to commercialization.

Green chemistry, in the words of Paul Anastas (widely considered its creator), means carrying out chemical activities—including chemical design, manufacture, use and disposal—in such a way that hazardous substances will not be used or generated. The system is focused on using the creativity and innovation of scientists and engineers to design and discover next-generation chemicals and materials that perform effectively without harm to people or the environment.

The green incubator at Queen's has so far served as a springboard for 220 chemical innovations and material science innovations, all of which satisfy the criteria of being economically viable and environmentally sound.

These are "new processes, new products that can increase competitiveness, create jobs and not damage the environment," Resendes says. "With this wonderful thing called green chemistry, you can mitigate the risk to the environment and remediate damage done over

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the years and still facilitate commerce. You minimize the footprint not just for the process but for the value chain, for everything that feeds your process right from extracting the resource from the ground to what happens at the end of its life. You can have your cake and eat it, too."

GreenCentre holds the licences for Jessop's "Switchable Solutions," which are three classes of solvents and a surfactant. Jessop calls them "switchable" because the simple addition or removal of CO₂ turns their properties on or off in chemical mixtures.

The switches can be made repeatedly between a form that is miscible with water and a form that isn't, and the materials can be readily recovered without additional energy or chemicals.

GreenCentre's preliminary findings suggest Jessop's technology can be used to extract bitumen from oilsands deposits with minimal water consumption, no need for tailings ponds and a potential 25 per cent reduction in processing costs.

"Because of the benign nature of these solvents, operating costs associated with production, waste treatment and power consumption are greatly reduced, as is the overall environmental impact," notes Resendes. "These switchable technologies are true 'game-changers' at the most fundamental level."

Resendes adds that he is proud of GreenCentre's early success and optimistic it can help turn the tide for Canada.

"I always considered myself a bit of a patriot," says the child of immigrant parents. He was a toddler when they left their isolated home in Portugal's Azores archipelago in search of opportunity.

"I grew up in the Canadian system, a beneficiary of the Canadian way of life, and I've had a lot of opportunities given to me just because my parents decided to try Canada. I received a world-class education at the University of Toronto, and though I emerged with some debt, that debt was equivalent to the cost of a new Hyundai. I always wanted to help Canada capitalize on what it has. Canadians are not very aggressive and yet there are so many things to be aggressive about in a positive way."

In industry, discoveries frequently founder on technical or regulatory shoals when the first and only question is, "Can it make money?"

At GreenCentre, "Is it good for the environment?" ranks equally, and the shift in priorities is supported by seasoned decision-makers from the chemical industry who serve on the board of governors and provide sponsorship.

"We have 10 industry sponsors, multinational companies from across the chemical

value chain," Resendes says. "There's no consultant in the world that can tap into the expertise we can tap into. It's valuable on the governance side but extremely valuable on the up-front assessment of a technology. We tap into their value chains and customers. They can identify what provides the greatest potential impact on the economic and environmental fronts. We continually reassess the environmental opportunity and the business opportunity. If either goes missing, we abandon the technology; [our projects] need to satisfy both those criteria. Fortunately, they go hand in hand."

What else goes hand in hand in Resendes' world is passion and creativity, in both his work and his play.

"A horribly low percentage of people do what they like to do for a living. As much as I enjoyed my time in industry, I really find myself now in a position where I truly enjoy what I'm doing. It transcends discipline," he says. It's "the whole idea of flow—you enjoy it, you have the right skills to do it, you get into a mental mode called flow and everything just clicks."

He discovered that concept in university after an inauspicious start.

"The night before [an] exam, I took the cellophane off my textbooks—and you know what? It didn't work. I got a letter advising me to withdraw without academic penalty lest I be withdrawn with academic penalty. I had in the low 60s in every single subject I took, except for 38 per cent in first-year chemistry."

So, chagrined, he withdrew and came back the next year.

"I said, 'I'm going to take chemistry, there's just no way it can be that hard.' I fell in love with it. It was the first time I found myself wanting to be in class. I just couldn't wait to get my hands dirty, so I started working in a research lab the summer of my second year. I got interested in polymer science, and [got fired up by] Ian Manners, who's now at the University of Bristol. I broke one of the rules of doing graduate work in Canada and stayed at the same school. Why would you go anywhere else when the most interesting work was being done there?"

The sentiment applies equally today at GreenCentre—where yet another Canadian-born technology could help progress development of the oilsands industry into a more sustainable economic driver.

GreenCentre assumes all the costs and risk and when commercialization is successful, it returns 75 per cent of the end proceeds back to the university.

"The goal is to generate return on investment across the country," says Resendes. "We just want to feed the machine [and increase] discoveries." **OSR**

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