EPIC CEO INTERVIEW: OLEKSII ILCHENKO

In this interview, **Antonio Castelo**, PhD, EPIC's Technology Manager for Bio-Medical and Lasers, talks to **Oleksii Ilchenko**, CEO of Lightnovo, a Danish producer of unique Raman systems for applications ranging from in vivo skin diagnostics to crystallographic orientation mapping of solar cells.

AC **What's the background to you co-founding Lightnovo as CEO?**

OI In 2010, after an MSc in Nanophysics and nanoelectronics at Taras Shevchenko National University of Kyiv, I did a PhD Optics and Laser Physics that focused on Raman and Infrared spectroscopy on binary liquid solutions. I then worked for a couple of years as a Researcher at D.F. Chebotarev State Institute of Gerontology NAMS of Ukraine, working on optical layout designing and constructing of self-made spontaneous high-speed line focus Raman microscope for in-vivo biological measurements.

AC **What's the background to you co-founding Lightnovo as CEO?**

OI In 2016, I decided to search for a postdoc position in Europe and successfully applied for a postdoc position at the Technical University of Denmark (DTU), where I worked on Raman instrumentation development and chemo metrical data analysis. During this period, I focused on the development of Raman based low concentration analysis of chemicals in water based multicomponent media, and from 2017, I began to explore the possibility of commercialising the Raman technologies I'd been working on. These efforts led to the creation of Lightnovo, which I cofounded in 2019 with Anja Boisen, Head of the Nanoprobes research group, as a spin-out from the DTU.

AC **How has the company developed?**

OI Our aim was to develop and manufacture a range of unique mirrorless Raman spectrometers and microscopes for consumer, industrial and research applications. Over the last four years we've developed a range of products. Our MiniRaman spectrometer (pictured above) is an advanced miniaturised Raman spectrometer with an integrated, patented, reference channel. This device allows for a continuous calibration of the device which provides fast and reliable results and makes it ideal for materials identification and quantitative measurements. Related to the MiniRaman spectrometer is our MiniRaman microscope for 660 nm and 785 nm laser wavelengths - the world's smallest confocal is Raman microscope - which performs Raman shift and Raman intensity calibration during every spectrum acquisition. We also provide a range of RG Raman spectrometers and RG Raman microscopes for any kind of demanding Raman spectroscopy applications that require high spectral resolution and RG, extremely stable laser power, high sensitivity and broad spectral range.

We now have five full-time employees in Denmark, seven contractors in US and in Ukraine.

AC **What makes your products unique?**

OI Our spectrometers differ from those already on the market because they are small, compact devises offering high performance at very affordable prices for end users. This is possible thanks to the built in reference channel that doesn't require temperature stabilised lasers or large battery units to power them. Other devices on the market take minutes to stabilise performance, but our devices work as soon as you turn them on, which is a great benefit for first responders like firefighters and the police as well as for military applications.

AC **What are your main application markets?**

OI Our main customers are academic, medical, and industrial R & D research labs, where there isn't a requirement for industrial standards. But we're now working on making our devices IP65 certifiable so we can expand into industrial, pharma, security and military applications.

Current applications for the MiniRaman spectrometer include ex-vivo tissue and cell chemical imaging; imaging of pharmaceuticals and chemicals; and forensic analysis. Applications for the MiniRaman microscope include in-vivo chemical diagnostics of skin; drugs identification; and detection of hazardous materials and toxic liquids.

AC **What have been your main personal challenges?**

OI When I first came to Denmark, I had to make a few adjustments. At the university in Ukraine, I was using 50-year-old equipment from USSR and my salary was $100 a month. In Denmark, salaries were obviously higher, but the other main difference was that I had the responsibility to find enough funding to pay my salary and buy the equipment I needed for the research.

As regards starting Lightnovo as CEO, my main challenge was that I had no experience of running a company, so I had to rapidly learn from others about what mistakes to avoid, how to get funding, how to do proper budgeting and reporting, how to structure the supply chain and manufacturing process, and how to manage people.

AC **How do you see the future?**

OI Regarding our business strategy, we have focussed on short-term profitability rather than long term projects, which, by definition, have a very delayed profitability. The reasons for this are twofold. Firstly, as investors want short term profitability, it's hard to get private funding for projects that don't show a return for five-ten years. Secondly, to generate revenue, we decided to create products that we could sell immediately. This means that each application we sell is different. For example, methanol detection through a Whiskey bottle, detection of gas forms in high pressure solar cells, and in Vivo skin measurements. The advantage of this approach is that for each device we sell, we get customer feedback on user friendliness and performance which enables us to improve our technology based on customer feedback rather than relying on expectations of how end users will react to performance.

Right now, we produce one or two systems per week, and I don't see it makes a lot of sense to create larger manufacturing facilities without getting the orders. We have several customers who plan to order in bulk and when this becomes a reality, then of course, we will need to expand.

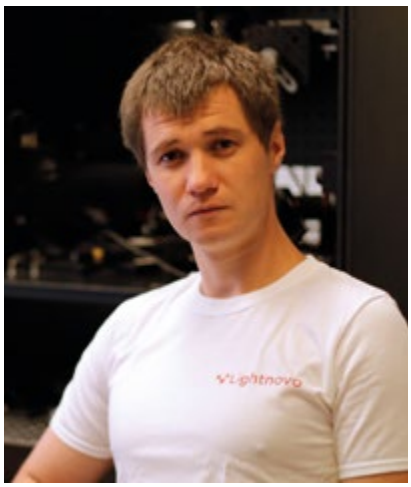
While our products have some unique benefits, one of our objectives is to make our devices more robust and able to operate in harsh environments. Until now, our devices have been designed to operate in lab environments with controlled temperature and humidity. Accordingly, they have been designed to operate at temperatures between 15 -25 °C and are relatively fragile. For miliary and industrial use, we will need to redesign the optomechanics to make the devices more robust so they can survive a dop of one metre onto concrete, and are able to function in adverse weather conditions in a temperature range of -20 to +45 °C. Additionally, we will need to improve the software to make our products more user friendly and better able to accommodate customer requirements. For example, by creating a spectral library when using Raman spectroscopy for identification of materials.

AC **If you started again, what would you do differently?**

OI I'd start looking for investment earlier so I could hire enough people to do the technical work. When I started, I was too involved with technology problems doing alignment and optical designs day and night, which created some delays and frustration because we didn't have enough people to fulfil the orders that we were receiving. While we currently have four active grants from Europe and the Danish government, they are only for research and additional funding has always been required for actually running the company – recruiting and paying salaries, inventory, and purchasing equipment for manufacturing.

AC **What's your advice for the next generation of entrepreneurs?**

OI It very much depends on the country you are based in. Ideally, it's best to look for local funding inside a university or at a country level so you can boost your early-stage ideas into a higher technology readiness level. In Denmark we have proof-of-concept grants that are available for PhD or postdoc students irrespective of their track record and number of high-impact publications. What they care about is the idea and your motivation to commercialise it. Secondly, it's important to get advice from people who have experience in high-tech startups so you can avoid mistakes and grow your company in a sustainable way.



Oleksii Ilchenko, CEO and Founder, Lightnovo.