

Dr. Kristin Taton, Director of Science & Engineering
Innovative Surface Technologies, Inc.

Advances in Lubricious Hydrophilic Coatings for Challenging Substrates in Interventional Medical Device and Biotech Applications

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Interview conducted by: Christopher Holland, Growth Diagnostics LLC

Chris: Dr. Taton, thank you for giving us time today. To start, tell us a little about ISurTec.

Dr. Taton: You're welcome Chris. ISurTec has been around nearly 20 years. We're a technology company founded by Dr. Patrick Guire, a successful experienced entrepreneur, along with myself and a few other folks. Our depth and expertise is in surface modification technologies for medical devices and biotech applications. Our first product was a lubricious hydrophilic coating mainly used for interventional medical devices such as guidewires, catheters, implants, etc. It's an obvious concept once you think about it – make something slippery so when you put it into the body, it reduces discomfort and is less damaging to the body. The complexity comes into play when you think about making something slippery to tissue and arterial walls and then durable, so it doesn't come off while being navigated through the complex vasculature inside the body.

Chris: Very interesting! I work with startups and know how hard it can be to gain traction, so you all have done well for ISurTec to be here and thriving today.

Dr. Taton: Well, we're obviously proud of our technology and think it's among the best on the market. The technology has been used by over 100 companies globally on a wide variety of medical devices. We have a great partnership with Harland Medical who sells our solution and complements this with providing coating equipment and services. We've also just expanded to accommodate our growth, and now have a larger manufacturing space.

Chris: That's impressive, congratulations! Talk to me about this new technology. What is it?

Dr. Taton: I'll give a brief background to start. Medical and biotech devices are made of a variety of substances... plastic polymers, rubber, metal, silicon, etc. Some of these are easy to coat, like polyurethane catheters, while some require surface modification or a surface 'interface' to make a coating stick. That's typically done through application of a primer, similar to what you do when painting. Now some of these are extra-difficult like silicone rubber, certain metals, and silicon or ceramics.

Chris: Why is silicone rubber challenging? What's silicon used for?

Dr. Taton: For silicon, think silicon chips. Lab-on-a-chip is a growing biometric field. As far as silicone rubber, there's a number of challenges. First, it's tacky to the

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touch. Lightly sticky. Next, it has a very low surface energy so coatings don't easily stick to it. And finally, it contains highly mobile small polymers that move through the surface and can disrupt any applied coatings. But it's increasingly popular in medical devices, implantables, and wearables because its properties are conducive to it being on/inside the body and it's very manufacturable and easy to form. It's used in catheters, endotracheal tubes, feeding tubes, plastic surgery implants, to name a few.

Chris: One thing jumped out at me because I have some experience working with tacky rubber sheets and their properties. If silicone rubber is tacky then they must be doing something to it now to be able to use it inside the body.

Dr. Taton: There are different treatments for rubber but all of them have challenges. Plasma treatment adds complexity to the manufacturing process and has a short lifespan. PTFE fluoropolymer is used but only in shorter-term applications, and it's

less slippery than a lubricious hydrophilic coating.

Chris: Why's your solution better?

Dr. Taton: PhotoPrime SR primer enables application of the lubricious hydrophilic coating which will last longer and be more slippery. It's applied with the same dip-coating process that a lubricious hydrophilic coating is, and so fits in with well-known manufacturing processes. We believe it could also be bound in the extrusion process for silicone rubber tubing, making application of lubricious coatings even simpler.

Chris: What about application

beyond silicone rubber?

Dr. Taton: Any substrate that is difficult to coat is a candidate, for instance we have used it on PEEK and polyimide. There are other uses as well. We have case studies being published which highlight unique applications such as innovative use in lab-on-a-chip assays or as a part of a drug-eluting stent.

Chris: What started you on the path to creating PhotoPrime SR?

Dr. Taton: PhotoPrime SR was actually developed initially by some of my former colleagues (shout out to Jie and Laurie) in order to coat silicone rubber. If you coat silicone rubber *without a primer* and apply light friction, you can actually see the coating come off almost like an orange peel where the coating encases the silicone rubber and is bound to itself cohesively, but completely lacks adhesive force to the silicone. Hence these large sheets of coating delaminating away.



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Chris: Were there any particularly difficult challenges you had to overcome?

Dr. Taton: One of the largest challenges was actually how well the primer sticks to things. PhotoPrime SR is designed to stick well to hard to coat surfaces, and it does - it sticks to everything! Including glassware that you use to make it and analyze solutions of it. An external company developed an analytical method for PhotoPrime SR for a client and later complained that they had to trash every piece of glassware that the solution touched because they couldn't get the primer off! It makes a very durable coating.

Chris: How does this fit into ISurTec's product portfolio?

Dr. Taton: Our goal is to improve patient care by removing cost and complexity barriers to applying and using lubricious coatings. PhotoPrime SR broadens application and utility of lubricious coatings. Next on our plate is releasing our ISurGlide Plus technology that eliminates the priming step now needed for a large number of substrates, meaning one less product needed and one less manufacturing step for medical device manufacturers.

Chris: I like your mission, you continue to touch on making life simpler for OEM customers. Let me ask, you've been at ISurTec for a long time now, since inception if I recall correctly – what keeps you coming back? Besides a paycheck.

Dr. Taton: Ha ha. I love the environment. We're a group of passionate, curious, scientists and engineers and I get to focus on solving really challenging surface modification applications for our customers and partners. We're encouraged to dive deep and be creative to make sure that we meet their requirements. For instance, they may want a product that is more lubricious for one application, where for another product application it's durability that's most important. And when it comes to particulates, the lower the better! Therefore, we really customize our solutions to meet our customers' requirements.

Chris: Thank you for your time! Next time let's do a video interview.

Dr. Taton: You're welcome! But I think there's a rule against scientists and video interviews.

About Innovative Surface Technologies, Inc.

Founded in 2004, ISurTec began with creating the first pre-mixed, ready-to-use hydrophilic coatings for the medical device market, significantly reducing cost and complexity for the industry. Today ISurTec is a global leader in surface modification technologies for medical devices and biotech applications, manufacturing hydrophilic coating solutions sold under the ISurGlide®, Lubricent®, PhotoPrime®, and Tylicent® brand names as well as ISurCell™ ultra-low attachment and ISurTherm® thermoresponsive cultureware products. ISurTec's ready-to-use and custom coatings have been used by over 100 small and major medical device manufacturers both in the US and overseas. ISurTec designs, develops, and manufactures all coating solutions locally in Minnesota.