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Q&A with Michael Trotter, CEO of Arradiance, LLC enabling greater Safety for Batteries and Electronic Devices with their Atomic Layer Deposition Nanofilm Materials

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CEOCFO: ***Mr. Trotter, the tagline on the Arradiance LLC® site is 'Molecular Innovation.' What is involved?***
Mr. Trotter: We are experts in Atomic Layer Deposition (ALD) and we enable a multitude of technologies, from High Energy Physics to bio technologies. Our technologies work with high aspect ratio and high surface area substrates to either provide a barrier type of thin film or a functionalized film, with different electrical properties.

CEOCFO: ***What are you working on now?***
Mr. Trotter: We provide thin film coating that is not possible with traditional chemical vapor deposition or physical vapor deposition. It provides a uniform, pinhole free coating that is required for devices, for example, batteries. You have heard of Lithium Ion batteries catching on fire in mobile phones and electronics. ALD encapsulates the Lithium, improves the cycle performance and makes the battery safe.

CEOCFO: ***What was the genesis of your process?***
Mr. Trotter: The Company was founded in 2003. We were initially going after a parallel direct write eBeam technology, for semiconductor lithography. After about five years, and the development of a successful prototype, we understood that it was going to take another significant round of investment to go after that technology and a number of the investors backed out. However, during that process we developed in house capabilities for Atomic Layer Deposition to resolve one of the technical challenges that we had faced. Through that we ended up developing the equipment to produce the thin film coating that was required. Once we realized we were not going to be able to go after the lithography solution we started focusing on providing coatings and equipment to the University research and development market.

CEOCFO: ***Are the industries that should understand Arradiance, aware of what you do?***
Mr. Trotter: I would not say all industries. We have solid equipment installed base at this point and good brand recognition in the market. That said, ALD is a niche market. Many of our customers may not be necessarily focused on Atomic Layer Deposition, but it is an enabler for the research that they are focused on; batteries being one example. Atomic Layer Deposition is not necessarily their focus, but it is a thin film coating that is required for them to move forward in their research.

CEOCFO: ***Do you have a set line of products? Do you customize depending on what a client wants?***
Mr. Trotter: Our product family is branded as GEMstar. We are currently on the GEMstar XT series today, which is the second generation. I will call it somewhat of a Swiss Army knife. It is configurable to meet a particular researcher's need,

whether that is in terms of temperature or substrates - we coat everything from 2D substrates to 3D substrates, including particles. Imagine trying to put a coating around talcum powder, for example. It is a very fine powder. Try putting a uniform coating around one grain of that. The tool is configurable for that. We offer some custom configurations in addition to our standard product line. We have done that for a number of our government research facilities and national labs Customers.

CEOCFO: ***Would you tell us about your recent agreement with MicroLabs Scientific?***
Mr. Trotter: This agreement is in response to our commercial customers who typically want to move very quickly through the learning cycle. So, rather than merely coating their substrates, with MicroLabs, our partnership enables the customer to obtain the coated devices and the analytical information in a single cycle of learning, so that when we return the substrates they have the characterizations needed to determine their next steps.

CEOCFO: ***You mentioned the latest version of GEMstar. What has changed? What are the improvements?***
Mr. Trotter: The incremental improvements are, for example, we have a door mounted particle rotation coater that enables the researcher to keep all of their materials and substrates inside of the inert environment in a glove box. In the past the only way we were able to offer the rotational coater was through the metrology port, which plugs outside of the glove box. We were able to improve the working conditions for our researchers. The other area is improvements in our vapor pulse capability. Researchers are now able to work with materials that were impossible in the past; enabling low volatility precursors.

"The reason you would want to choose Arradiance is the compact footprint, the access to a process library and collaboration with Arradiance material scientists and engineers. We are not a transactional sales environment. We enjoy working with researchers to enable their projects and play a part in their success. We truly do participate in technologies across the board. There are new discoveries in batteries, solar, and green energies that are still coming to the forefront today. We truly are enabling technologies for our world and beyond."- Michael Trotter

CEOCFO: ***Where does the process and the human element come together?***
Mr. Trotter: I think it is intertwined. We are very fortunate to have a very capable team of material scientists. We have an extremely capable Chief Operating Officer, whose experience with the big box capital equipment manufacturers enabled Arradiance to offer big box capability in a compact solution. All of those talents and experiences have been brought together to be able to build a tool that is low maintenance and has a very small foot print, that is able to meet some of the capacity constraints that common in the universities and even commercial R&D labs.

CEOCFO: ***Do your customers know what they want or do you work with them to figure out what their needs?***
Mr. Trotter: That is a good question, Lynn. I think it is a mixed bag. In some cases our customers know the result of what they are looking for and they need assistance with, "What are the right materials I need to work with, what is the right environment," and through that process we are able to identify, not only the precursors for materials that they need to use, but the temperatures and process requirements. However, in other cases the customers know that they need to use ALD (Atomic Layer Deposition), but it is not something that they are familiar with. Many times it starts out with us providing a coating. Then there is a round of metrology and maybe we tweak those coatings to obtain different electrical properties and either they end up implementing that in their process and going into high volume production type equipment or they end up purchasing a hardware solution from us that will allow them to continue their research and development or even into low volume, high mix production.

CEOCFO: ***Are there industries or segments that are behind the curve, not paying the attention? How do you reach potential customers, as well as the people that may not be as up to date?***
Mr. Trotter: That is certainly an area that we are struggling with ourselves. In terms of university research and commercial R&D, we are pretty well positioned. We are attempting to move into maybe more mature industries. I will select one. Oil and gas for example. They put a lot of materials into their steel, like Molybdenum, to slow down the corrosive processes that occur during distillation. That is an area where we may be able to help. However, you are talking about very large pieces of equipment. Ultimately, coming up with a hardware solution that would help in that space may prove very challenging.

CEOCFO: ***How is business at Arradiance these days?***
Mr. Trotter: Business is good. You can imagine, being largely in the R&D in the university space, when the government curtails spending it has a trickle-down effect on us. That is certainly an area where we would like to lessen our dependency.

CEOCFO: ***What is you geographic reach today? Do you see that expanding?***
Mr. Trotter: We are very global at this point. We do business in Europe, India, Asia, Japan and even Australia. It is amazing the broad set of technologies that Arradiance touches. Yes, I do foresee Arradiance continuing to expand into new technologies and markets.

CEOCFO: ***Is there competition for the process you have developed or is that proprietary?***
Mr. Trotter: The general Atomic Layer Deposition market is very competitive. We have few competitors in the space that we participate in. Atomic Layer Deposition has been around for about fifty years, therefore some universities will build a homemade Atomic Layer Deposition tool. While the tool may not possess all the capabilities of the tool that Arradiance provides, it enables the researcher to play with ALD. We do have proprietary technology that is in the microchannel plate space. Folks may not understand what a microchannel plate is, but that is what enables technologies like night vision goggles. The plate is the enabler inside of the device that that enables you to have the cascading electrons to be able to see something without very limited natural light. That technology is not only in the military space, but if you take that and put that into a photo-detector, that is an extreme enabler for the high energy physics space, where they are looking for the elusive neutrinos. These devices also possess applications for other markets like medical and homeland security.

CEOCFO: ***Why choose Arradiance LLC?***
Mr. Trotter: The reason you would want to choose Arradiance is the compact footprint, the access to a process library and collaboration with Arradiance material scientists and engineers. We are not a transactional sales environment. We enjoy working with researchers to enable their projects and play a part in their success. We truly do participate in technologies across the board. There are new discoveries in batteries, solar, and green energies that are still coming to the forefront today. We truly are enabling technologies for our world and beyond.