



# Air Products ComPAT<sup>SM</sup>-LoK Compatibility Assurance Program

Mary Haas

*Welcome to another Podcast from Air Products. I'm Ed McKendry, and today's program is a second in a series on Air Products ComPAT<sup>SM</sup>-LoK Compatibility Assurance Program. Once again, we're speaking with Dr. Mary Haas who is the technical lead on low-k dielectric materials. Mary, thank you very much for being with us today.*

*I'd like to ask your first question – tell us, how did you get involved in the ComPAT-LoK project?*

Well, Ed, as you mentioned, I'm currently the technical lead for dielectrics at Air Products. Air Products has had a long history with the development and supply of low-k precursors, approximately 8 years. We have a very strong platform and history of knowledge in the structure property relationships and the performance of those low-k materials. We also have programs in many of the formulated products and chemistries that impact the low-k integration, and we recognize that over the past several years, that combining the expertise from those various programs and looking at the chemistry more holistically in terms of integration rather than individual product performance, was going to be a great benefit to our customers.

*Talk a little bit about some of the specific integration challenges that you had in that porous low-k area and how did this ComPAT-LoK project address that.*

When you go from a dense low-k material to something that contains porosity, several things happen. One, of course, is that you're lowering the dielectric constant, which is what you need for device performance. But as you do that, in general, you're also decreasing mechanical properties and also ending up with a film that contains a substantial amount of porosity or air.

When that film is then integrated with a number of formulated products and gases and chemistries, there is the potential for an incompatibility to take place where either you're adsorbing or desorbing, retaining or somehow damaging the porous film. The ComPAT-LoK program addresses the potential for negative impacts on the film and how to minimize them through our chemical and structure property knowledge.

*So, is this ComPAT program all done – I mean, you've started it, you had some good success with it, and now you're done? Is that the situation?*

The program is far from done. So, at this point, we've generated quite a body of knowledge, mostly focusing on our k=2.5 dielectric constant material, which has approximately 30% porosity and is being developed and adopted by a number of end users at 45 nanometers. So, we've seen great successes, we've put down fundamental relationships, we're now translating those to lower dielectric constant materials such as 2.2, 2.0 and below for future generation nodes. Now what we've seen is as you go to even more porous materials and you increase the total porosity, maybe make some structural changes and morphology changes, the challenges become significant to integrating those films. We feel that the ComPAT-LoK program is going to be one of the cornerstones of addressing those challenges.

*So as you've been out sharing information and meeting with customers, what kind of feedback have you had on this whole integration assurance program?*

The feedback has been overwhelmingly positive. So, not only device manufacturers who we collaborate with, but from equipment manufacturers, academics and consortium, we've had very positive collaborations with aspects of our ComPAT-LoK program. The other great benefit is that when we established the structure property relationships and the understanding to make a chemistry compatible with a porous low-k film, that allows us to very quickly tailor that compatibility to a customer's existing integration scheme. As we know, each customer has slightly different needs and integration schemes, so it's one of the powers of the program that it allows us to even more quickly address those particular needs.

*Now, as your group looks at the roadmap out there, talk a little bit about what's next for your dielectrics group.*

So, for the dielectrics group we continue to look at materials for porous low-k, but as we develop our chemistries, an inherent metric now is this compatibility issue. So, we're working very much in parallel with our other teams to simultaneously come up with products that maximize the capacitance benefit and device performance that our customers can achieve. From what we've seen in PECVD and in the kind of technology and potential for chemistry that's out there, we think the future of porous low-k in terms of extendibility is very bright.

*If I'm listening to this podcast today, what is the key message that I should take away from this discussion?*

So Ed, I think what we've learned throughout this compatibility program and what we continue to learn is that with the right chemistry and knowledge, each product really can both have the product metrics and performance metrics, such as cleaning, mechanical properties, particle removal that's inherent to the product line, but it can also be fully compatible with the porous low-k. So, in our minds, it's not an "either/or", it's both, and that's fully what we intend to deliver to our customers.

*If we want to learn more about this subject, could you talk a little bit more about how they get that information?*

We have quite a bit of information on our website. It's [www.airproduct.com/compat](http://www.airproduct.com/compat).

*Okay, very good, once again for our listeners, it's [www.airproducts.com/compat](http://www.airproducts.com/compat). Mary, thank you very much for your time, we do appreciate it. And for our listeners, thank you once again for listening and we ask you to please continue to visit [www.airproducts.com/electronics](http://www.airproducts.com/electronics) and visit our eLearning Center for new podcasts and new programs as they become available.*

*Thank you for listening to this Air Products podcast.*