

The future challenges and opportunities of ALD technology

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The ALD technique was originally developed in early 1970's to produce high quality ZnS to meet the requirements of electroluminescent devices. The research group led by Dr. Tuomo Suntola was successful in demonstrating that the stepwise introduction of the metal and non-metal precursors to the surface can produce better ZnS than the other techniques used in the production at that time. Most importantly, after nearly ten years of reactor and process development, they could start real production of the devices which is still on going. The result could have as well been opposite, but fortunately they succeeded, and we can benefit from the fruits of their research today.

At the end of 1990's it took a while to get the ALD technique accepted especially in the IC industry, but now it is one of the established techniques among the other chemical and physical deposition techniques. The challenge for the ALD community is to find the best applications for this unique technique, but at the same time keeping the production requirements in mind. In order to accomplish that we must in detail understand the basics of the ALD technique independent which type of ALD, thermal, plasma enhanced etc. is in question. We must also realize the limitations. It is quite trivial to say that we cannot just simply use the technique for everything and, furthermore, all the ALD depositions are not as straightforward as the Al_2O_3 deposition from $\text{Al}(\text{CH}_3)_3$ and H_2O . Also we must remember that the real production environment is always very different from the research environment.

In this talk I will try to bring out some factors that should be considered regarding both the ALD depositions and various reactor types when discussing the future of the ALD technology in the present and possible new application areas.