

Meeting the new semiconductor market requirements in high-purity aluminum analysis with ARL iSpark 8860 OES Analyzer



“Semiconductor industry standards have changed over the last few years. Customer and end-user requirements in terms of product stability have now reached a very high level. Most of the alloying element concentration measured by OES must be centered between control limits which are always tighter. This requires a strict control of the manufacturing process. But more importantly, a good accuracy and repeatability of the analysis on the final product is essential to reach the higher requirement level.”

The Thermo Scientific™ ARL iSpark™ Optical Emission Spectrometer satisfies the most stringent requirements in terms of performance and accuracy for quantitative determination of trace and alloying elements in metals. Adapted to the harshest environments, ARL iSpark Metals Analyzer delivers industry leading quality and performance, year after year.

Introduction

LINDE PLC is a leading industrial gases and engineering company with 2018 pro forma sales of USD 28 billion (EUR 24 billion). The company employs approximately 80,000 people globally and serves customers in more than 100 countries worldwide. Linde delivers innovative and sustainable solutions to its customers and creates long-term value for all stakeholders. The company is making our world more productive by providing products, technologies and services that help customers improve their economic and environmental performance in a connected world.

PRAXAIR ELECTRONICS, a business division of LINDE PLC Group, provides the global semiconductor industry with process consumables including a full line of gases and materials, sputtering targets, CMP slurries, on-site services, chamber components including electrostatic chucks, and spare-parts logistics services.

PRAXAIR PHP, a part of PRAXAIR ELECTRONICS, is specialized in the process of high-purity aluminum refining and casting operation, in Mercus, France. High-purity aluminum above 99.9995% is mainly used in the production of sputtering targets for the semiconductor and flat-panel display markets but also for solar and light emitting diode (LED) applications. The factory has several automated furnaces dedicated to aluminum refining by segregation technology and owns several high purity casting units (DCC) allowing to propose and supply the following products to their customers: ingots, billets, slabs, plates, tubes, pellets and wires in aluminum or aluminum alloys with overall purity from 5N (99.999%) up to 5N5 (99.9995%). 2018 sales were about 17.3 M€ and the plant employs about 40 people. PRAXAIR products are exported all over the world, mainly in USA and Asia. Through their customers, PRAXAIR PHP is one of the leaders of high-purity aluminum sputtering target supply for the semiconductor industry.



PRAXAIR PHP, specialized in the process of high-purity aluminum refining and casting operation, in Mercus, France

Analytical needs

Today, PRAXAIR PHP laboratory has two Optical Emission Spectrometry (OES) instruments from Thermo Fisher Scientific. Firstly, a Thermo Scientific™ ARL™ 4460 OES Analyzer acquired in 2001 is used to measure the level of more than 20 elements at a ppm level, through all the steps of segregation and casting processing of the metal. ARL 4460 analysis helps to monitor the refining process as external contamination of the melt is one of the major concerns of high-purity metal producers.

Secondly, a Thermo Scientific™ ARL™ 3560 OES Analyzer acquired in 1987 is used to quantify the alloying element concentration of high purity aluminum alloys elaborated at our DC Casting houses. The laboratory technicians analyze around 50 samples a day (2 shifts per day) for melt treatment operation before alloying, after melt alloying and then after casting. As they supply cast products, alloying element concentration is an essential deliverable for all their customers. OES productivity is not the first driver, they focus mainly on analysis quality like accuracy and repeatability which are key parameters for them and their customers.



Challenges

Semiconductor industry standards have changed over the last few years and now, customer and end-user requirements in terms of product stability have now reached a very high level. Most of the alloying element concentration measured by OES must be centered between control limits which are tighter and tighter (for example +/-0.010% around nominal value). This challenge requires a strict control of the manufacturing process, but more importantly a good accuracy and repeatability of the analysis on the final product is essential to reach the high requirement level.

specifications, wishing to keep and retain the use of photomultiplier tubes considered as a technical reference for us. The recommendation was for an ARL iSpark 8860 OES Spectrometer, which we decided to acquire in 2018.

Benefits of the ARL iSpark OES Analyzer

Grégory Boisier explains: “Our experience using this new instrument has shown excellent results with regards to analysis accuracy, repeatability and long terms stability, much more than our previous and old ARL 3560. The good performance of this new OES increases the



Thermo Scientific ARL 4460 OES Analyzer



Thermo Scientific ARL 3560 Simultaneous ICP-OES

Why ARL iSpark 8860?

“One of our main objectives and challenges is to focus on stable product deliverables to customer.” explains Grégory Boisier, Technology & Laboratory Manager at PRAXAIR PHP in Mercus, France. He continues: “The ARL 3560 gave us an entire satisfaction through its 32 years of service! Since the requirements are higher, we decided to invest in a new OES instrument. We asked what should be the best OES choice to fit our

reliability of the deliverables for us – process control – and for our customers – product stability. Furthermore, we love the new Thermo Scientific™ OXSAS™ Software interface with the side scrolling banner. The menus are more intuitive than previous software like WinOE installed on ARL 4460. Software is faster, allows a better exploitation of data and all options provided improve the daily work of either laboratory technicians or managers.”

Conclusion

“We recommend the ARL iSpark OES Analyzer for the aluminum industry. Routine analysis is very easy to handle with no real operating costs. New OXSAS Software interface is intuitive, fast and improves the daily work of either laboratory technicians or managers. We check several standards every day and we are very satisfied with the results and the overall performance of the ARL iSpark 8860 (see below long-term stability data on one of our Certified Reference Material).



Operator using the ARL iSpark OES Analyzer

Furthermore, we appreciate working with Thermo Fisher for their technical knowledge and support, their after-sales service and maintenance even though our plant is located near the South-West of France, far away from their main sites. We will continue working with Thermo Fisher, aiming to replace our ARL 4460 OES Analyzer in the future.” concludes Grégory Boisier.



ARL iSpark Optical Emission Spectrometer

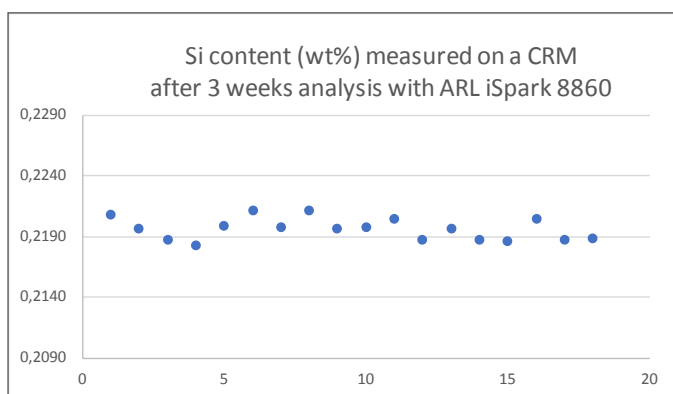


Figure 1: Long-term stability data on one of our Certified Reference Material

“The good performance of this new OES increases the reliability of the deliverables for us – process control – and for our customers – product stability.”

“New OXSAS Software interface is intuitive, fast and improves the daily work of either laboratory technicians or managers.”

Find out more at thermofisher.com/ispark

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