ARRADIANCE ***Unleaded Glass Technology***

Looking for Lead-free solutions for your existing glass products?

Most resistive glass components in instruments used for gas chromatography, mass spectrometry, electro-optics, high energy physics, and in medical applications contain some form of reduced lead oxide from the hydrogen firing process, required to make the glass electrically resistive. Most are aware of the requirements specified in the RoHS Directive 2011/65/EU and the impact it will have on a wide range of industries and applications. We possess the solution to eliminate the need for lead in your glass components.

Concerned about being compliant with RoHS?

Safety regulations in Europe (RoHS) call for elimination of lead glass products due to lead toxicity. No safe amount of lead exists, and the lead glass product industry relies on temporary extensions for the use of lead glass due to expire July 2024. Arradiance is your pathway to compliance.

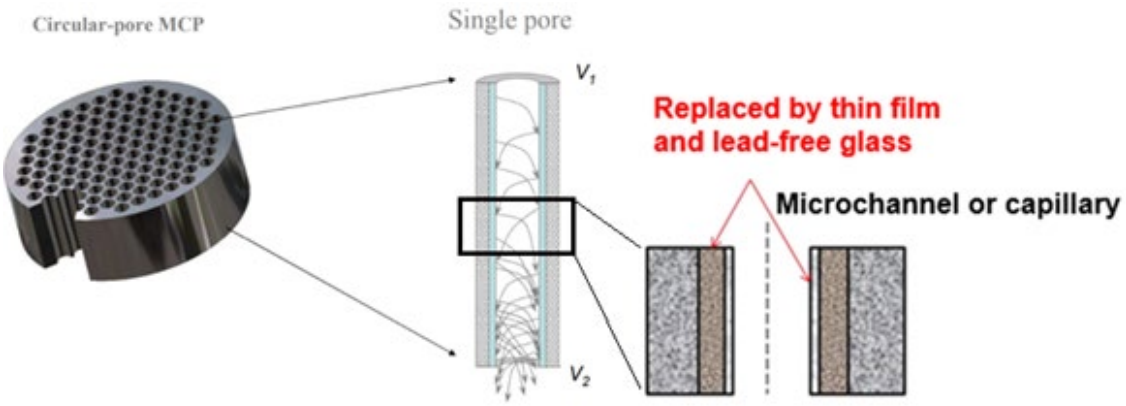
Arradiance possesses resistive film technology for lead-free glass solutions

Arradiance's proprietary technology enables the use of lead-free glass as a cost-effective replacement for conventional lead glass applications with similar or better performance capabilities. Arradiance has been providing this proprietary technology for more than 15 years to support customers across numerous applications.

Applications

Mass spectrometry applications:

Mass spectrometry instruments typically utilize high aspect ratio lead glass components. Arradiance provides thin film solutions on lead-free substrates for components in mass spectrometry instruments such as ***capillary inlet tubes***, ***channel electron multipliers*** (CEM), ***microchannel plates*** (MCP), ***reflectron lenses*** or ***drift tubes,*** delivering similar or improved performance as your current hydrogen-fired lead silicate glass components.



How mass spectrometry components benefit from Arradiance ALD technology:

Introduction to ALD

While Arradiance technology enables improved lifetime for mass spectroscopy components, it also opens the door to eliminating lead from these components. Delivering fired lead glass performance on non-lead substrates has been an elusive objective for the mass spectrometry market to comply with pending regulations. That solution exists today. Arradiance technology produces a film that can withstand operational and environmental parameters such as high voltages, elevated temperatures, vacuum, and atmospheric conditions, while delivering similar or improved performance. These films have been tested and used for more than a decade in electro-optical devices such as MCPs, image intensifiers and photomultiplier tubes (PMTs), with remarkable documented longevity and performance. The success of Arradiance ALD technology on high aspect ratio (more than 300:1) structures, such as MCPs and glass capillary arrays, demonstrates its potential value in the mass spectrometry markets for future regulatory compliance when applied to a variety of glass component substrates eliminating the need for hydrogen-fired lead glass.

Other applications

Imaging

Imaging applications differ somewhat from mass spectrometry in that they may require positional data in addition to capturing time-of-flight data. Data precision requirements for imaging applications require a higher quality substrate structure. ALD has been used successfully for many years with improving performance of components in imaging applications, but due to the quality challenges of lead-free

glass structures, not much progress had been made until more recently. Significant progress has been made in the quality of lead-free glass capillary/microchannel arrays, which, in combination with Arradiance ALD technology, make possible lead-free imaging detectors for applications like:

- Image intensifiers
- Neutron and gamma detection

Plus, in combination with advanced multi-anode position-sensitive charge collection designs:

- High energy particle physics experiments (MCP-PMTs)
- Astrophysics
- Medical field (positron emission tomography (PET) detectors)

Neutron imaging represents another area where Arradiance technology improves performance. Neutron imaging uses MCP-like components that are made of glass or other materials (for instance, PMMA plastic) that require surface modification to enable it to absorb thermal or recoil fast neutrons, with excellent detection of electrons and rejection of coincidence gamma events. Example applications where this technology is of value:

- Non-destructive testing
    - metallic assemblies/components opaque to conventional X-ray imaging technologies
    - water imaging inside metallic components
- Metallurgical - dynamic imaging of magnetic domain walls in ferromagnetic materials

Miniature electrostatic lenses and microchannel arrays

Arradiance invented and prototyped a silicon-based, ALD-enabled Microchannel electron amplifying array (MCA) to control current produced by cold-cathode emitters, that could be combined with electrostatic lenses. An example application would be maskless e-beam lithography.

Interested in going lead-free or improving the safety and performance of your products containing glass components?

Contact us

Contact Arradiance about our disruptive lead-free resistive film technology and learn more about its advantages beyond being lead-free.

Additional reading: Arradiance's resistive ALD and lead-free technology

Lifetime and Performance of the Very Latest Microchannel Plate Photomultipliers

Novel MCP device fabricated with ALD

Novel Fast Neutron Counting Technology

More publications using Arradiance technology may be found here.