

Scintillation Material Factory Company Profile 閃爍材料



光子是我們的事業 光子開拓人類的未來

 **Y&M TECHNOLOGIES**
www.ymtonline.com

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Our Manufacturing Facility

工廠簡介



Our scintillation crystal material factory is located in Beijing, and it operates in a 25,000 square feet facility dedicated solely to the manufacture of scintillation materials. Residing within the factory is a Class -10,000 manufacturing area and Class -1000 clean room for special handling processes.

Our company holds a position on the leading edge of scintillation crystal technology, we are proud of our tradition of excellence in the manufacturing and marketing of our products, such as CsI, CsI(Na), CsI(Tl) and NaI(Tl). We have also engaged in R&D for more advanced applications of scintillators including CdWO_4 , ceramics and plastics. With its broad product range and expertise in the industry, our company has been successfully in establishing the domestic markets and our products have been well received in the U.S., Europe, Japan, and Southeast Asia countries.

闪烁晶体工厂生产碘化铯 (CsI)，掺铊碘化铯 (Tl:CsI)，掺钠碘化铯 (Na:CsI)，掺铊碘化钠 (Tl:NaI)，钨酸镭 (CdWO_4)，塑料闪烁体，及荧光增感屏，同时还从事其它新型闪烁晶体及各种闪烁晶体制品的研究开发工作。特有的工艺技术和设备使我们的闪烁体材料、器件性能达到国际先进水平。我们的碘化铯，碘化钠晶体以及各种规格的阵列产品除在国内销售外，还远售美国、日本、欧洲、东南亚等国，深受广大用户的亲睐。产品广泛应用于高能物理研究、环境监测、地质勘探、石油测井、核医学、安全检查等领域。



Facilities including localized class-100 25,000² ft. manufacturing area, plus class-10,000 cleaning room for critical processes



Our state-of-the-art facility in Langfang, Hebei, China



Our Manufacturing Facility and Production Processes



Scintillation Crystal

閃爍晶體

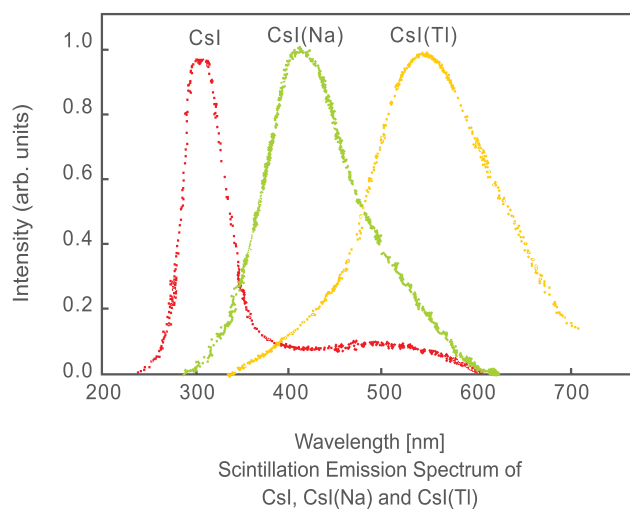
独特的晶体生长工艺、
可靠的封装技术，保证了晶
体的优异性能，并把对环境
的影响降到了最低，最大可
提供 $\phi 240\text{mm}$ 尺寸的晶体。

Cesium Iodine CsI(Na), CsI(Tl), and Pure CsI

Cesium iodine is often used as a scintillation crystal. Depending on the type of dopant used, other scintillation materials can be achieved: CsI(Na), CsI(Tl). Each has its own characteristics. Light output of other scintillators is determined relative to that of NaI(Tl), which is said to have a light output of 100%. The light output of CsI(Tl) is 47% that of NaI(Tl), whereas the luminescence efficiency of CsI(Na) is similar to that of NaI(Tl).

The dependence of CsI(Na) on temperature is not very significant, giving it an advantage in high temperature and outer space environments. However, the luminescence decreases quickly in low energy (less than 20 KeV) and hygroscopicity is stronger than that of CsI(Tl).

Pure CsI crystal is much less hygroscopic than CsI(Tl). Its emission consists of the fast intrinsic luminescence (10ns). The light output of pure CsI is 4-6%, but the great advantage of this crystal is its fast timing characteristics.

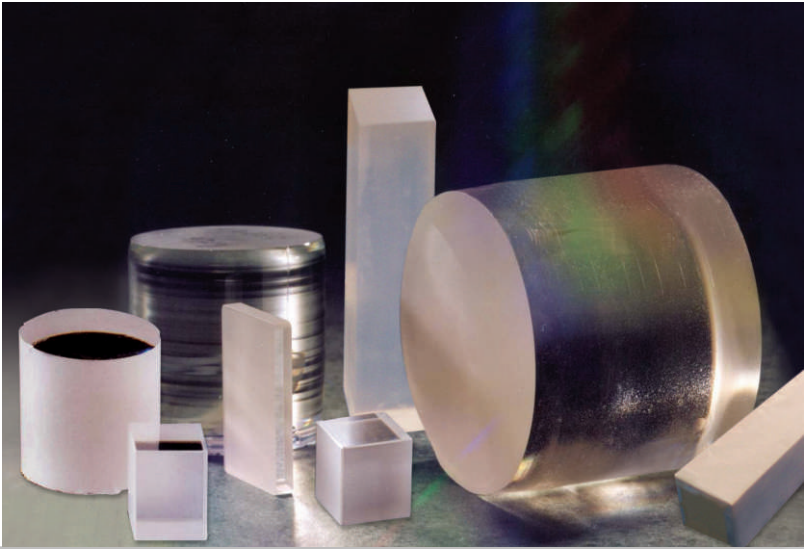


掺铊碘化铯 CsI(Tl)

光输出大，均匀性好，抗辐照能力强，余辉小，适合在高能物理实验中应用，适合在安全检查设备。已经在中微子探测等低本底试验中应用。

掺铊碘化铯 CsI(Na)

光输出大，相当于同样尺寸掺铊碘化钠的85%，抗震及抗热冲击能力强，适合在恶劣环境中应用。



纯碘化铯 CsI

荧光衰减时间短，适合在需要快速响应的场合使用。抗辐照能力强，在高能物理实验中有特殊用途。

掺铊碘化钠 NaI(Tl)

光输出最大，应用广泛，易潮解须封装后使用，成本低廉，发光效率受温度的影响相对较小。广泛用于探测 α β γ 射线。

Scintillation Crystal Physical Properties
常用无机闪烁晶体的性能

Scintillation Crystal 闪烁晶体	Photoelectron yield [% of NaI (Tl)] (γ rays) 相对光输出	Decay Time 1/e衰减时间 [μ s]	Wavelength of emission maximum [nm] 发光主峰	Refractive Index 折射率 [@ λ_{Max}]	Density [g/cm ³] 密度	Hygroscopic 潮解性	Hardness(Mho) 莫氏硬度
NaI (Tl)	100	250	415	1.85	3.67	Yes	2
CsI (Tl)	45	1000	550	1.79	4.51	Slightly	2
CsI (Na)	85	630	420	1.84	4.51	Yes	2
CsI	4-6	16	315	1.95	4.51	Slightly	2
BGO	20	300	480	2.15	7.13	No	5
CdWO ₄	30-50	14000	475	2.2-2.3	7.9	No	4-4.5
LYSO	75	41	420	1.81	7.1	No	5.8



Plastic Scintillator

塑料閃爍體

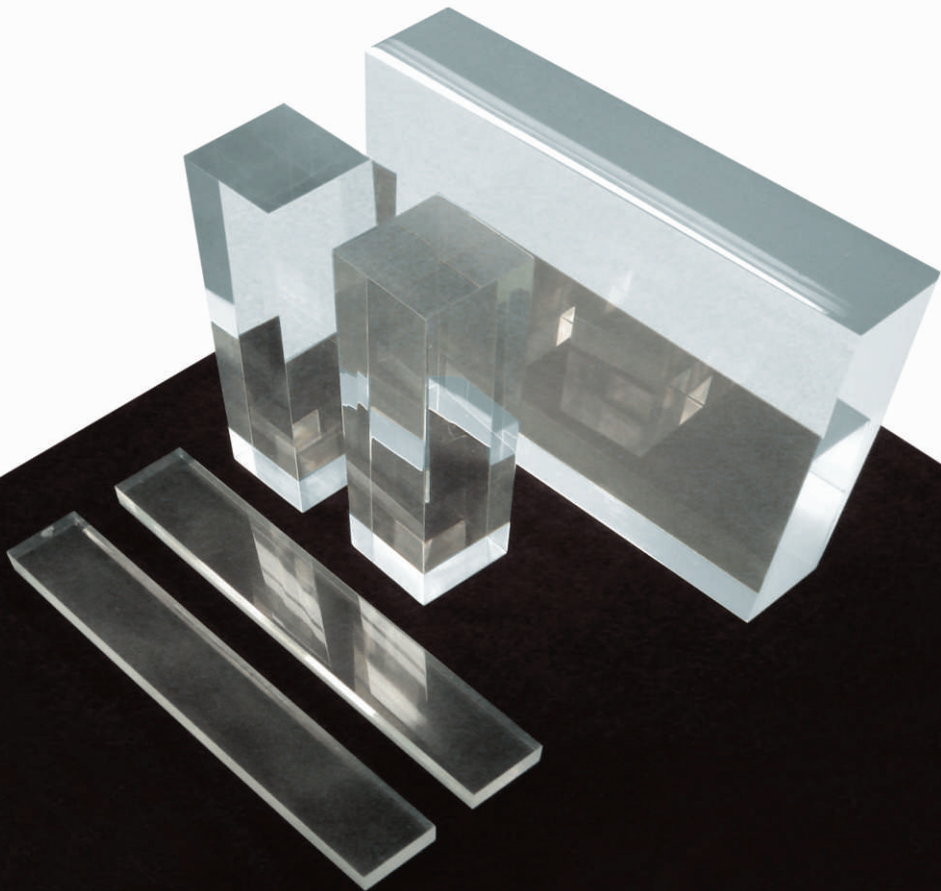
良好的加工性能、高的透明度、较低的成本，使得塑料闪烁体在核辐射探测领域有着不可替代的作用。我们生产的通用型塑料闪烁体在发光效率和透明度上有很好的平衡，以满足各种用途。

Plastic Scintillator consists of a solid solution of organic scintillating molecules in a polymerized solvent. It is soluble in aromatic solvents. They are unaffected by dampness, acids, lower alcohols, silicone grease or fluids.

The scintillation emission of typical plastic scintillators have maximum around 400 nm. They are characterized by a relatively large light output and a short decay time. Plastic Scintillators are often high performance, easy handling and at a relatively low cost.

Physical Properties

Base 基质	Density 密度	Refractive Index (ND) 折射率	Refractive Index at Wavelength of Max. Emission 在主发射波长的 折射率	Softening Point 软化温度	Coefficient. of Linear Expansion (<67 °C): 线膨胀系数	Vapor Pressure 蒸汽压	Alpha/Beta Ratio α/β 比率	Radiation Length 辐射长度
Polyvinyl toluene	1.032	1.58	1.608-1.605	70°C	Approx. 9x10E-5 /cm/cm/°C	Negligible. May be used in high vacuum.	0.072	43cm



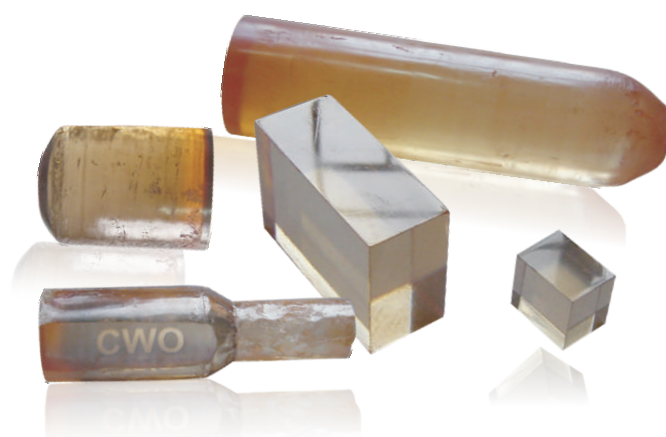
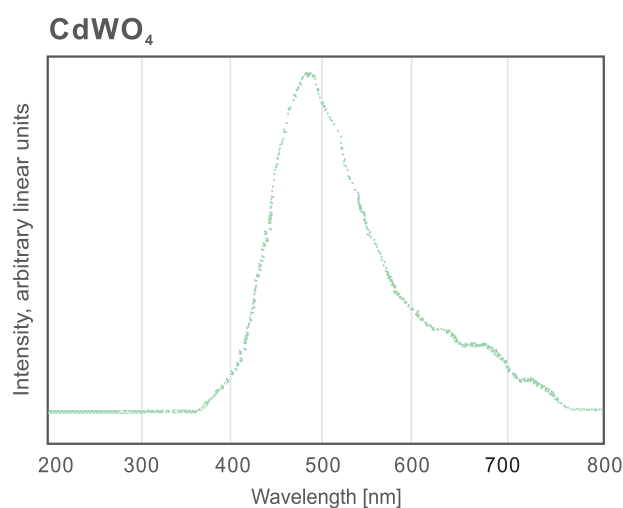
Plastic scintillators have become an extremely useful form of organic scintillator, they are now commercially available in a wide selection of different shapes as rods, cubes or sheets.

CdWO₄ Scintillator

钨酸镉

Cadmium Tungstate (CdWO₄ or CWO) is characterized by high density and a relatively large light yield, yet decay time is extremely low. Further, the afterglow of CdWO₄, when subjected to X-Ray irradiation, is very low typically less than 01. after 3 ms. and demonstrates very good radiation resistance. All these features are significant and make CdWO₄ a primary scintillation crystal for CT scanners. CdWO₄ is the most widely used scintillator for computer tomography as well.

CdWO ₄ Properties											
Density [g/cm ³] 密度	Melting Point [K] 熔点	Thermal Expansion Coefficient [C ⁻²] 热膨胀系数	Cleavage Plane 解理面	Hardness [Mho] 硬度	Hygros-copic 潮解性	Wavelength of Emission Max. [nm] 发光主峰	Lower Wavelength Cutoff [nm] 低端截止波长	Refractive Index @ Emission Max. 在主发射峰的折射率	Primary Decay Time [μs] 衰减时间	Light Yield [Photons /KeV] 光产额	Photoelec-tron Yield [% of NaI(Tl)] (for γ-Rays) 光电子产额
7.9	1598	10.2 x 10 ⁻⁶	<010>	4-4.5	no	475	330	2.2-2.3	14	12-15	30-50



CWO 钨酸镉 在所有闪烁类晶体中具有最优良的闪烁特性，它的密度高、因而对能量的吸收完全, 反应速度快、余辉小、以及不潮解等优点。它能在高速成像的同时保持图像的清晰、对爆炸物的探测也更准确有效。闪烁晶体CWO是制造XCT(X-Ray CT)及PCT(Positron CT)闪烁探测器的关键材料。研制CWO将为我国医疗及安检设备性能的改善，满足国内外的更高的需求创造条件。

Fluorescent Screen For X-ray Detection

荧光增感屏

随着第三代同步辐射源的出现，由荧光屏和CCD耦合组成，具有亚微米级空间分辨率、快速在线成像功能的探测器在医疗、安检、工业、科研等领域将会得到广泛应用。

Fluorescent Screen

Ceramic scintillator uses and trends are presented in light of issues related to their uses in advanced medical and industrial X-ray detectors for CT imaging applications. Transparent ceramics offer an alternative to single crystals for scintillator applications such as gamma ray spectroscopy and radiography.

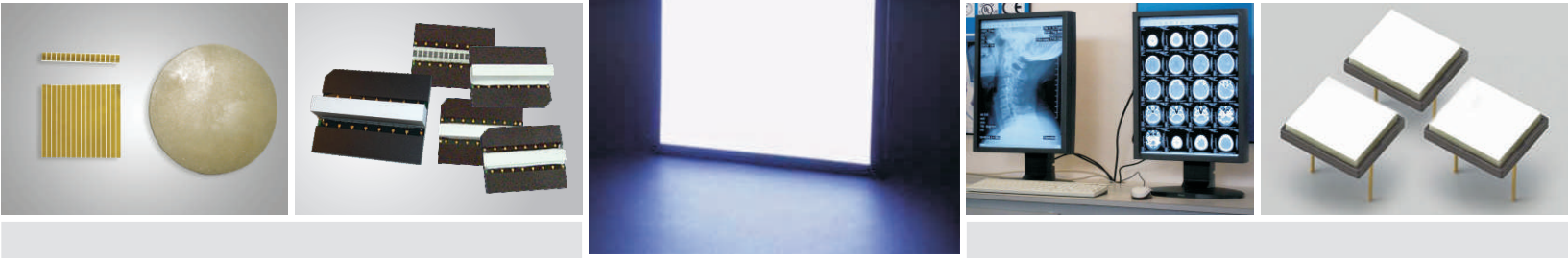
Direct conversion utilizes a selenium photo-conductor. Indirect conversion utilizes a CsI:Tl or Gd2O2S:Tb scintillator in conjunction with a silicon TFT.

Each system has certain advantages that should be considered. Indirect systems using Gd2O2S:Tb have the advantage of heightened stability, improved safety, lower cost and minimized environmental impact.

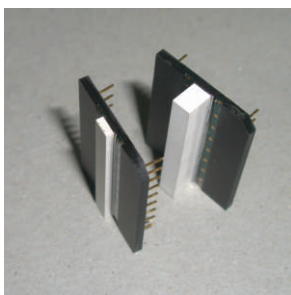
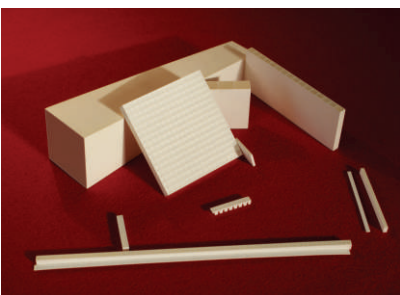
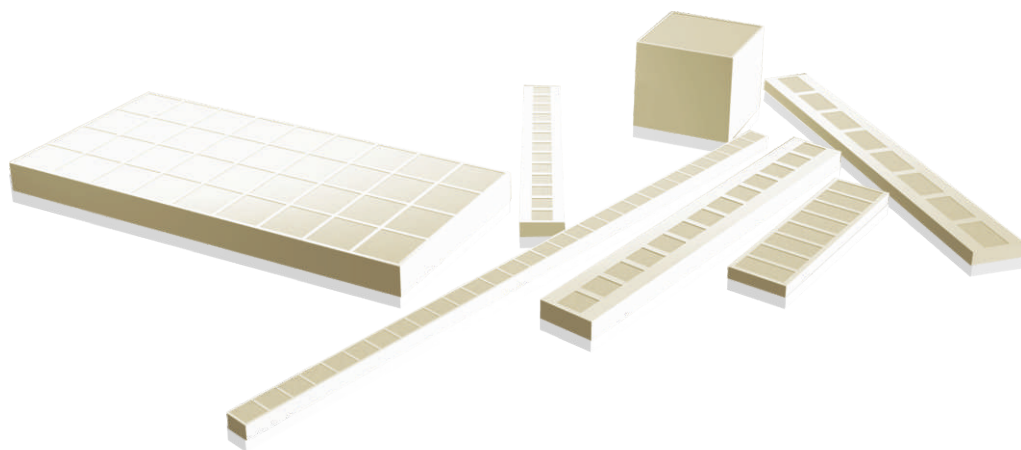
Physical Property

Phosphor 成份	Emission Peak 主峰发射波长 [nm]	发光强度 [a.u.]	Decay Time 衰减时间 [us]
Gd ₂ O ₂ S:Tb	540	1100	298.1
Gd ₂ O ₂ S:Tb, Dy	540	1200	/
Gd ₂ O ₂ S:Pr	512	5000	4.53
Gd ₂ O ₂ S:Pr,Ce	512	5200	2.357
Gd ₂ O ₂ S:Eu	627	2800	/

Parameter	Value
Phosphor	Gd2O2S:Tb
Emission Efficiency	16.0
Emission Colour	Green
Emission Peak (nm)	545
Effective Atomic #	59.5
Absorption Edge (kv)	50.22
Specific Gravity	7.3



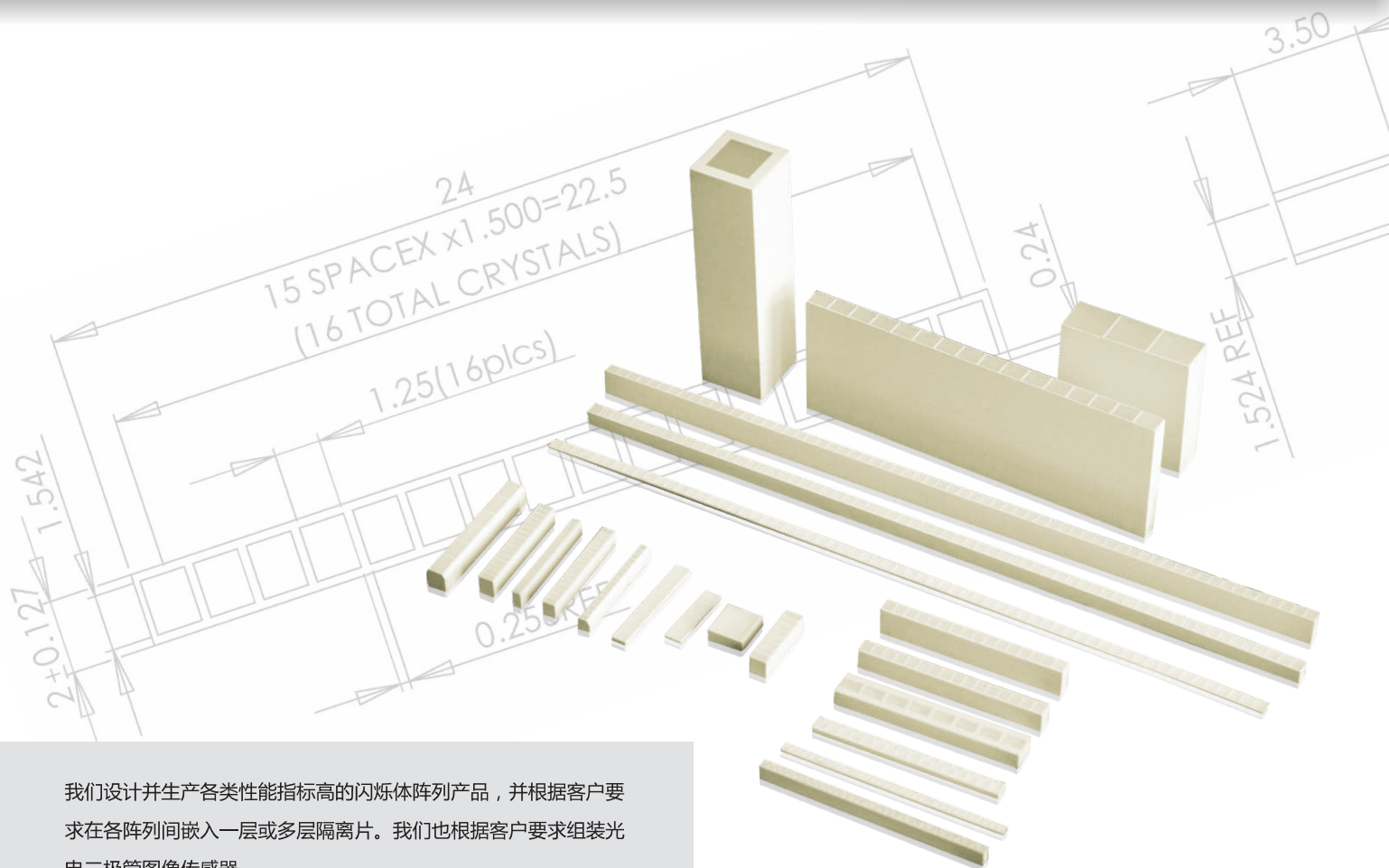
Scintillation Arrays 閃爍體陣列



We design and develop high-resolution and highly sensitive scintillation crystal detector arrays to achieve excellent image quality. The challenge is to develop a finely pixilated scintillation crystal array with high detection efficiency. We couple scintillation arrays to photodiodes at customer's request.

With our customers in mind, we offer a variety of packaging options, such as titanium for added strength, multi-dimensional arrays and flexible plastic shapes.

We can package our crystals to meet your needs.



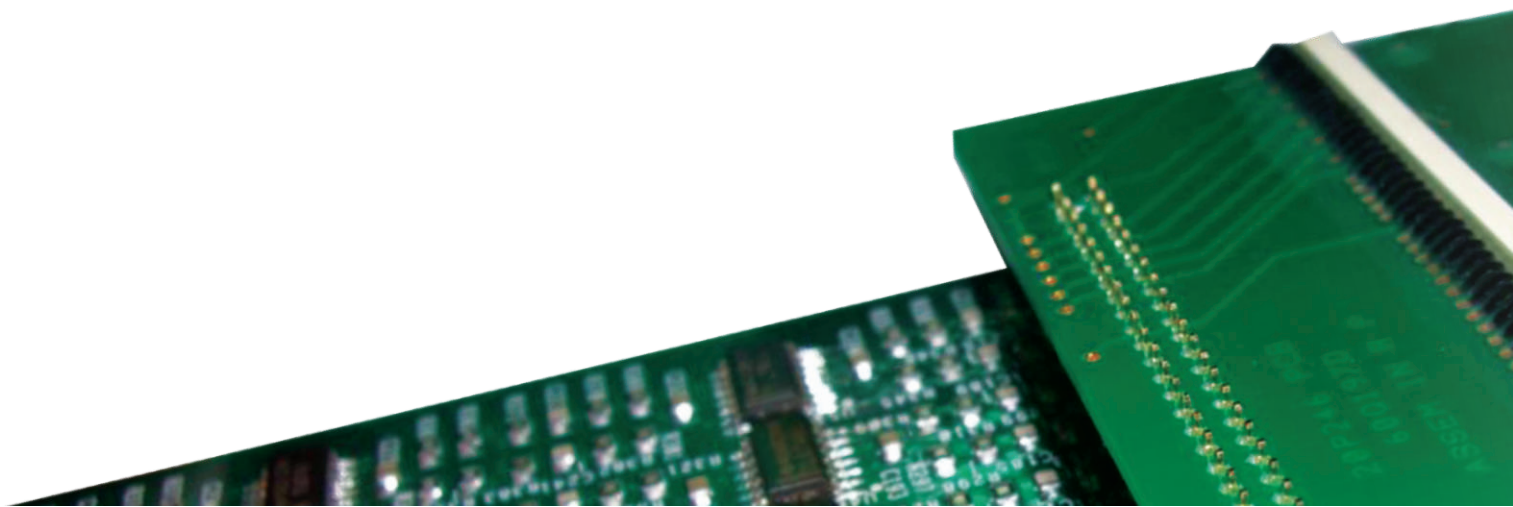
我们设计并生产各类性能指标高的闪烁体阵列产品，并根据客户要求在各阵列间嵌入一层或多层隔离片。我们也根据客户要求组装光电二极管图像传感器。

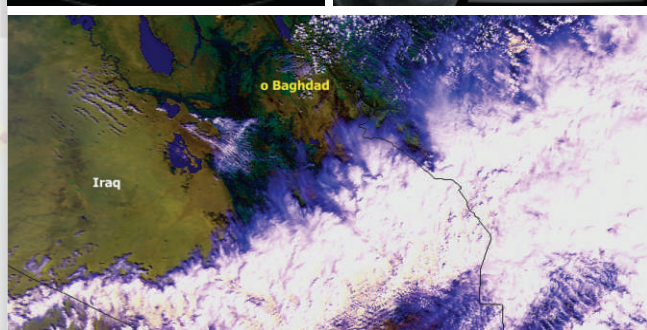
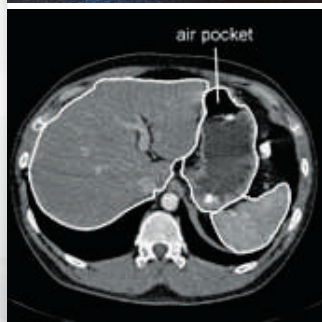
Applications 應用領域

The first use of a scintillator dates back to an experiment in 1903. Now scintillator couple to detectors are used in a broad spectrum of applications, including fundamental research in particle and nuclear physics, oil exploration, field spectrometry, container and baggage scanning, bio-physics, aerospace physics, industrial gauging, and medical diagnostics and imaging.

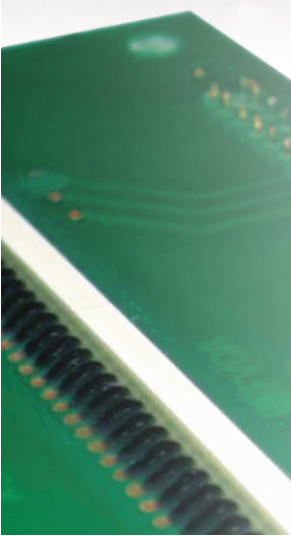


闪烁晶体的发展已经度过了一个世纪的漫长岁月。在早期，人们曾使用玻璃、塑料乃至液体闪烁材料。而如今，无机闪烁晶体具有密度高、稳定和性能优良等显著特点，从而成为闪烁材料的发展主体。X射线断层扫描相机(XCT)和断层扫描相机(PET)的出现及其快速普及，更使闪烁晶体成为当今人工晶体材料领域中少数几种有重大经济效益的主流晶体之一。由于光电技术的突飞猛进，物质经过紫外线照射后发出的荧光更得以广泛应用。以荧光成像做生物分析，使人类对生命科学以及自然界的探索进入一个新的领域。目前闪烁晶体产品广泛应用于高能物理研究、环境监测、地质勘探、石油探井、核医学、安全检查等领域。





Serving diverse markets and industries is what has made our Beijing Hamamatsu scintillation crystals and arrays a leader in the industry. From nuclear medicine to research, we not only satisfy our customers but also help them remain industry leaders.



Our Commitment to Quality 质量管理

Our employees are committed to customer service and quality. Every one of our employees undertakes rigorous and continuous training on quality standards from the day they start with the company. We are committed to delivering superior products and we

- To meet customers' requirements constantly.
- To remain vigilant in monitoring the quality system so that the latest techniques and trends in quality management are implemented.
- To provide the highest-quality optonics products available on the market in a consistent manner.

Our Quality Standards and Management

GB/T19001-ISO9001 ■ YY/T0287-ISO13485

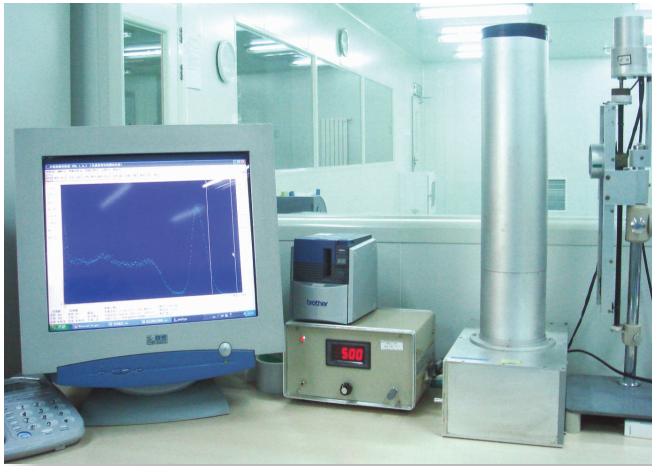
We continue to maintain and improve the quality management system established in accordance with Standards GB/T19001-ISO9001 and YY/T0287-ISO13485.

质量控制

保持并持续改进按 GB/T19001-ISO9001和 YY/T0287-ISO13485 标准建立的质量管理体系；不断制造出满足顾客要求的光子技术产品；

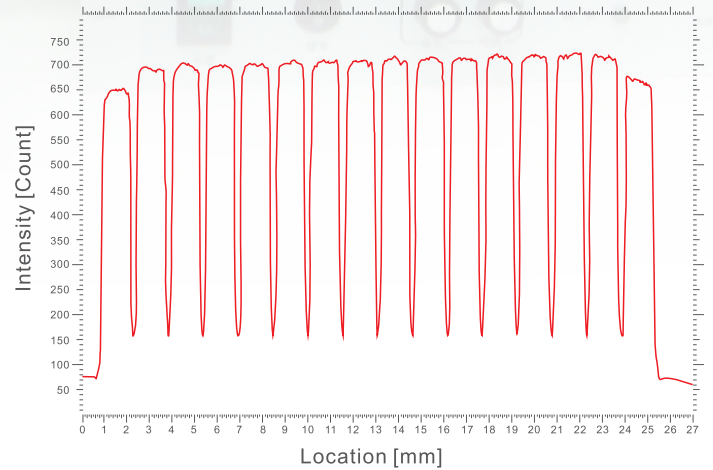
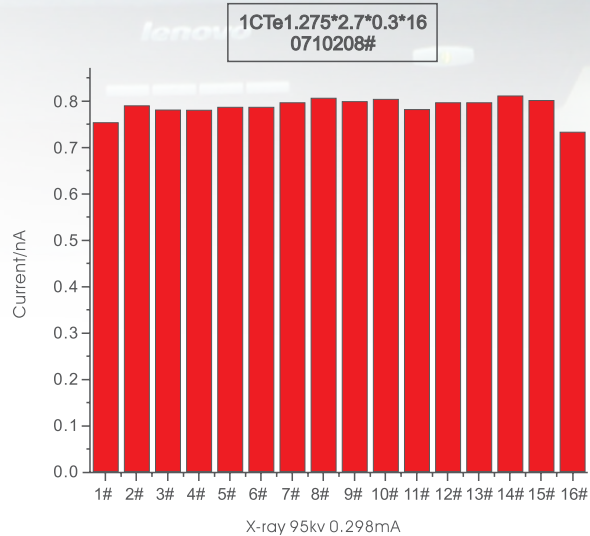
制造一流产品，满足人类需要是本公司的长期目标。





Part of the challenge with regard to quality improvement is to recognize that the program goes beyond a series of standards and requires willingness to implement new management concepts that impact how the company is run. At BHP, quality measures are used as a force that drives new, improved product design and better planning. The quality of our products also impacts the enthusiasm of our work force; the highest reward for the employees is to realize they are part of the winning team across the industry.

我们不断满足客户要求，持续改进质量体系，永远提供一流产品





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