Brighter Times

光辉岁月

New fluorescent powders make neon more efficient.
新一代荧光粉使霓虹灯更具效能

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1 可见光的形成
Filling the void 填补空隙

With cold cathode lighting, such as white neontubes, visible light is generated from UV light waves in the tube via the fluorescent powders. The mercury ultraviolet light has an energy peak at a wave length which corresponds to the excitation value of the fluorescent powders, or 254 nm. This means that the maximum amount of energy conversion will take place. This transforming invisible ultraviolet energy into visible energy is done by the fluorescent powders through their molecular structure. Light is generated by a recombination of electrons in the molecule when the emitted energy in one atom is lower than the absorbed energy by a surrounding atom. Atoms inside any solid-state body, such as the fluorescent powder, aren't free, but are always close to their neighbors. Thus, the energy from an atom excited by the UV transfers to its surrounding environs. A traveling electron will fill a void near the excited atom.

可见光是由紫外光线的发射能量低于吸收能量所形成的，在固态个体(如荧光粉末) 内的原子， 不是自由悬浮而是互相连系的， 因此,受激原子产生的能量会传播至周围,使运行在原子外的电子填补其附近的空隙。

If the nearby void's energy level doesn't match the energy level of the travelling electron, the energy now released as light is less than the absorbed energy creating the first void. Thus, the wavelength of the emitted light is longer than the wavelength of the absorbed light, rendering visible light if the energy difference is in the visible range. (emitting en electron of lower energy is a longer wavelength)

若周围空隙的能量水平与运行电子起初轨道不匹配，所释放的能量(如光)低于吸收能量，便会形成第一度空隙。如此， 当发射能量的波长比吸收能量的波长长,并达至相当的差距时， 便会释放出可见光。

The process isn't complete, because the first void still isn't filled. A cascade of electrons fills the void and dissipates the residual energy. Ultimately, the crystal's original state remains unchanged; the process can be repeated without changing the fluorescent material's properties. Changing the absorbing atom's surroundings changes the energy difference -- and, thus, the wavelength and color -- of the emitted light.

这过程还未完成， 因为第一度空隙仍未被填充， 待一排排的电子去填补这些空隙并将剩余的能量消散,而晶状体(如荧光物料)的原态始终保持不变；这过程会不断地重复且又不改变荧光物料的属性。在改变吸收原子的围绕物同时会改变成不同的能量，相对地改变发射光线的波长和颜色。

For example, consider the mineral zinc orthosilicate; if I place manganese and zinc atoms together, I will obtain a green light (standard-sign green). But, when I use silver instead of manganese, the reaction emits blue light, because the electrons within silver atoms exhibit different energy levels in their orbits than manganese electrons.

以硅酸锌这类矿物为例，若把锌和锰的原子放在一起会产生绿光(标准绿)；若以银代替锰，则会释放出蓝光，这是由附属于银和锰原子上的电子在其轨道上运行时释放不同的能量水平所致。

Conversion efficiency 对换率

The conversion efficiency and, thus, a neon tube's total light output at a given electrical input, is based upon the probability that every UV lightwave will be absorbed into the fluorescent powder and deliver the desired process. A precise energy-level ratio must exist between incidental light waves, and absorbing and emitting atoms.

霓虹灯管在一定量的电输入时的总光度输出，是依据荧光粉所能吸收不同紫外线的程度及其衍生的反应而得出的。因此，通过不同的光波、吸收原子和发射原子，可计算出一个准确的能量指数。

Ideally, the emitted light generates only a single wavelength, wherein all energy transforms into the single color, and provides the highest efficiency and most intense color. But, in reality, wasted energy is expended, which somewhat limits color brilliance. **Fig. 3** demonstrates standard-sign blue, whose chemical name is calcium tungstate.

理论上讲，若发射光线产生的是单一的波长，其所有能量会转变成单一的颜色，事实却不然，多余的能量会扩散并限制颜色的光芒，(图三)所展示的传统蓝，其化学物名为钨酸钙

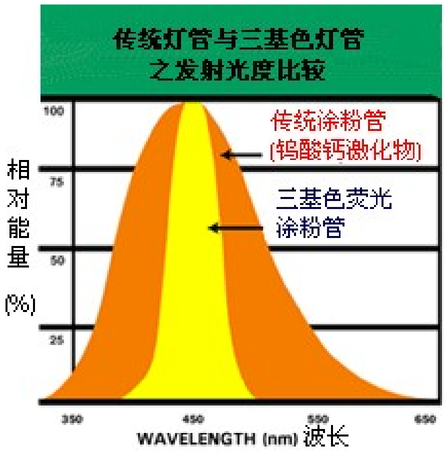


Fig. 3: Wavelength and light-intensity emissions of standard-sign blue neon and modern, rare-earth, fluorescent-blue neon tubing. The EGL Horizon Blue rare-earth phosphor emits in a very narrow band, yielding a more visible impact than standard-sign blue.

三基色荧光蓝色霓虹管与传统蓝色霓虹管的不同波长及放射光线的强度比较。前者比后者发射光的波幅窄得多，得出的可见光亦明显较多。

2 荧光粉与霓虹灯

The benefits of fluorescence 荧光粉的优点

Physicists have researched fluorescent materials, in an effort to engineer materials with defined energy levels, that confine emitted energy into a narrow band of unmistakable color (**Fig. 3**). This graph is normalized to the total light output; thus, you can see that the new, rare-earth blue emits in a very narrow band, with its total intensity much more concentrated. This yields a more powerful, visible impact.

物理学家在研究荧光原料方面付出了很多努力，通过不同的能量水平及其发射能量，计算出产生精确颜色窄波的原料。图三所示为正常化的总光输出，你可以从中发现一种新的篮色稀土荧光粉所发射的波幅非常窄及总强度相当集中的光效。

Three high-intensity, rare-earth phosphors mix to yield EGL Designer whites(a.k.a. triphosphors, which concentrate energy into three narrow bands of red, green and blue (similar to TV screens) to create a white wavelength. These new, fluorescent materials produce much brighter whites than traditional halophosphate whites. By contrast, unstable halophosphates distribute energy in a wide wavelength range.

以三种高性能稀土荧光粉混和制成的三基色荧光白管，将三段分别为红、绿、蓝(如荧光屏的三原色)的窄波汇聚到一起，所产生的一致白色波长，比传统不稳定的卤磷酸钡荧光粉产生阔波的白光显著明亮。

Std. 6500 on top, EGL Designer 71 on the bottom
标准6500度(上面)与EGL Designer 71(下面)

EGL Designer 71 on the left,std.6500 on the right
EGL Designer 71与(左边)标准6500度(右边)

But, these very intense, narrow-band emitters may create problems backlighting digital prints, or in applications that require a high, color-rendering index (see *ST*, August 2002, page 20). Therefore, the sign industry has developed fluorescent materials that provide very good color rendering at high intensity without reaching the extremely high lumen output of narrow-band, rare-earth, triphosphor whites.

然而这些非常强的和窄波的发射体会产生一些问题。如做数码印刷品的背后光源，在运用高要求色彩管理时，会因光度太集中而出现颜色偏差。因此，标牌工业开发了白色的稀土(三基色)荧光粉，通过抑制其窄波的最高流明度输出来达到管理色彩的目的，解决色彩一致性的问题。

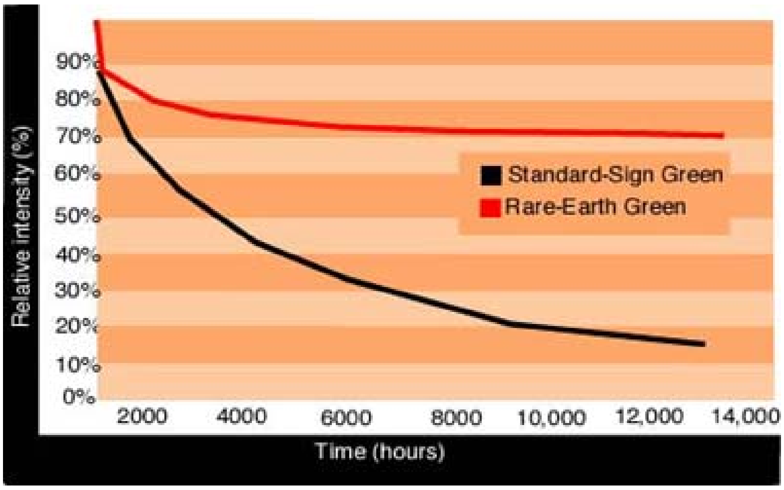
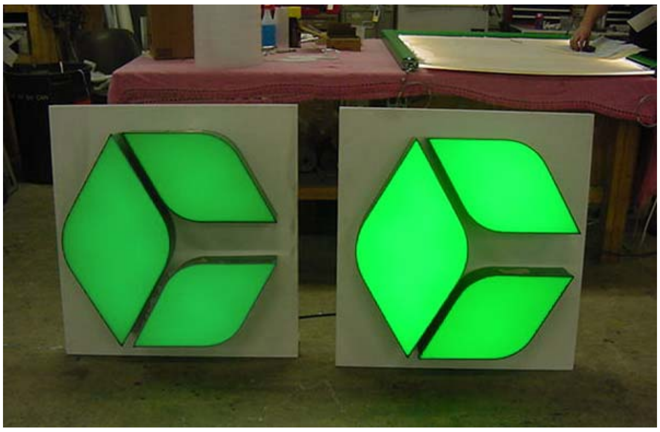


Fig. 4: A comparison of the light intensity standard-sign green and rare-earth, fluorescent green maintain after thousands of operating hours. Rare-earth green(EGL Tropic Green) maintains more than 75% of its initial intensity after more than 15,000 hours.

三基色荧光绿灯与传统霓虹绿灯的亮度比较，后者的亮度会随时间不断减退，而前者在 15000 小时之后仍保持 75%的亮度。



Ex.1 Channel letter on left using standard 6500 & the channel letter on the right using EGL Tropic Green

左边是安装了传统霓虹灯的槽型字，右边是安装了 EGL 三基色荧光灯的槽型字

Parting thoughts 回顾

Some "old-school" fluorescent materials deteriorate quickly, whereas new materials hold up quite well inside a neon tube. **Fig. 4** shows the contrasting, light-output decay of standard-sign green -- the oldest material still in use -- and a modern, rare-earth-green fluorescent powder.

一些“古老”的荧光粉的衰退速度非常快，与之相比，新式荧光粉能牢固粘着在灯管内。如图四，新式稀土绿色荧光粉与现在仍使用的旧式荧光粉之间的对比亮和光输出的差异是相当显著的。

Some say a lamp's useful life ends when 50% of its initial intensity is lost. Thus, the old sign-green tubes must be replaced after roughly 5,000 hours (although such green signs last sometimes more than 50,000 operating hours). Rare-earth green maintains more than 75% of its initial intensity well after more than 15,000 hours. The experimental data noted here was a different estimate than many calculations conveyed in various lightsource ads.

一般来说，当灯的寿命终结时，其亮度最多只有原来的 50%。传统的霓虹灯在 5000 小时之后因光色暗淡都必须更换(虽然有些灯管能存活 50,000 小时之久)。而三基色管在使用 15,000 小时之后仍能保持 75%以上的亮度，这个结论是通过许多照明杂志的实验所证实的。

Summarily, careful engineering has increased neon-tube fluorescent coatings' luminous efficiency an average of 15 to 20%, and has stemmed light-output loss quite adeptly.

总而言之，精心研制的霓虹荧光涂粉可有效提高发光系数 15%至 20%，并可遏止光输出的流失。

3 霓虹先驱者

Neon Pioneers 霓虹先驱者

Since 1927, EGL began the business of neon parts production and by 1975, EGL had become the world’s largest manufacturer of neon products, with more than 50 percent of all neon signage worldwide containing EGL electrodes, tubing, gases, tube supports, or other components.

自 1927 年起，EGL 已开始制造霓虹灯配件的事业，1975 年，EGL 成为世界最大的霓虹产品生产商，供应全球 50%以上霓虹及标牌工业所需的电极、灯管、气体、灯脚及其他零配件。

The company’s line of processing equipment also expanded to include crossfires, torches, ribbon burners, bombarder transformers, chokes, diffusion pumps, vacuum pumps, and a wide variety of other equipment – virtually everything needed to build a complete neon plant. In addition, EGL developed a comprehensive line of cold cathode lamp blanks and housings, as well as high-output fluorescent lamps.

公司拥有一系列的加工设备，生产如双向炮火、排火、轰击变压器、真空泵等一切霓虹灯厂所需的设备。 此外，EGL 还提供一系列的冷极管灯原料，冷极管插座及高输出荧光灯管。

Today, EGL is still owned and operated by the Cortese family, now in its fourth generation.

Over 10,000 sign shops and corporate managers in 85 countries now specify EGL products and equipment for their signage and architectural lighting.

时至今日，EGL 仍由哥得思家族所拥有和管理，现在已是第四代。

全球有 85 个国家的 10,000 家标牌公司及企业经理在制造标牌和照明建设时都指定使用 EGL 的产品及设备。

To meet this demand, EGL operates an 80,000 sq. ft. manufacturing facility with highly-specialized, state-of-the-art equipment, raising quality to new heights and increasing production capacity, while continuing to develop the world’s most comprehensive, most advanced line of neon products.

为了达到这些要求，EGL 开设的 80000 平方尺厂房装置了高度专业性和先进性的生产设备，以提升品质和扩大生产量，并不断为行业发展提供更高级和更广泛的霓虹产品。

详细资料请参考：Http://www.egl-neon.com