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Multifunctional Energy-Storage and Luminescent Material for Sustainable and Energy-saving Lighting for Tunnels (LUMA)

CHINA

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Chief Engineer: **Shouzhong Feng**

Senior Engineer: **Wei Gao Weixing Mao Lixaing Liu**

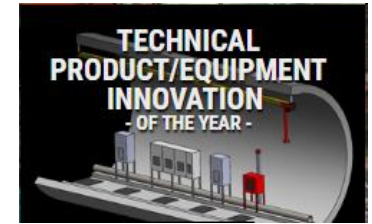
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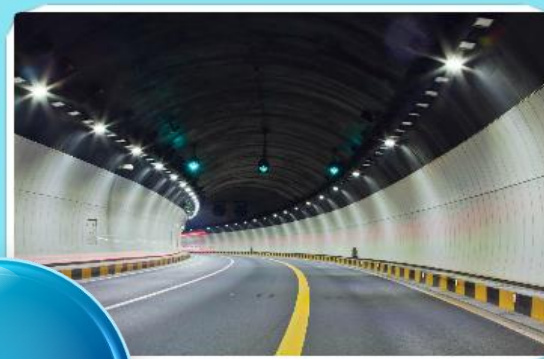
A

Fire escape?



B

Energy saving
lighting?



C

Air Quality?
Dusty?



D

Traffic Safety ?



Problem?

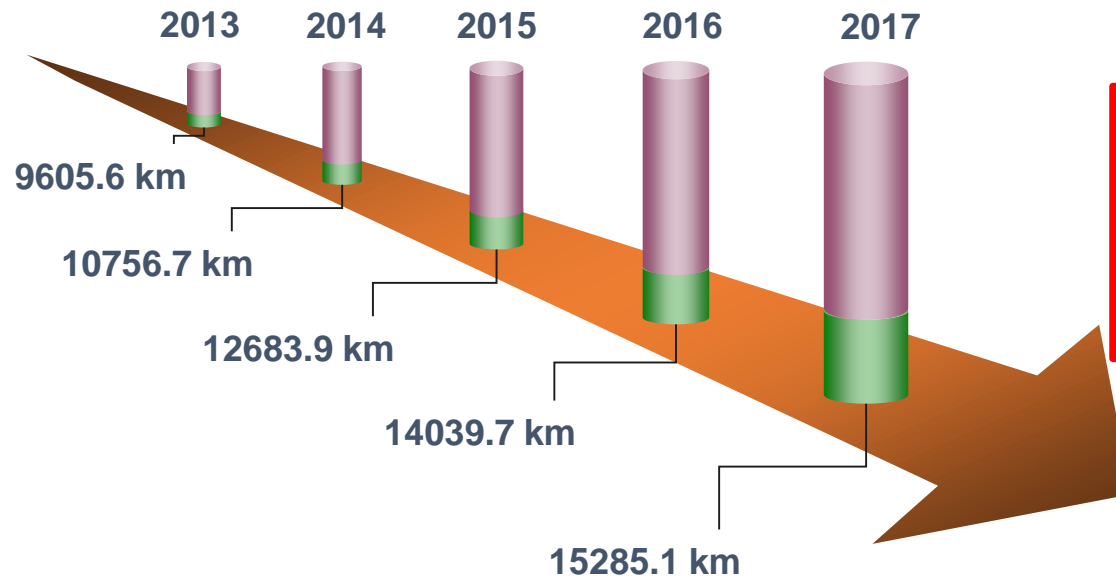
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Road tunnel kilometers
increase at annual rate
of **10%**!

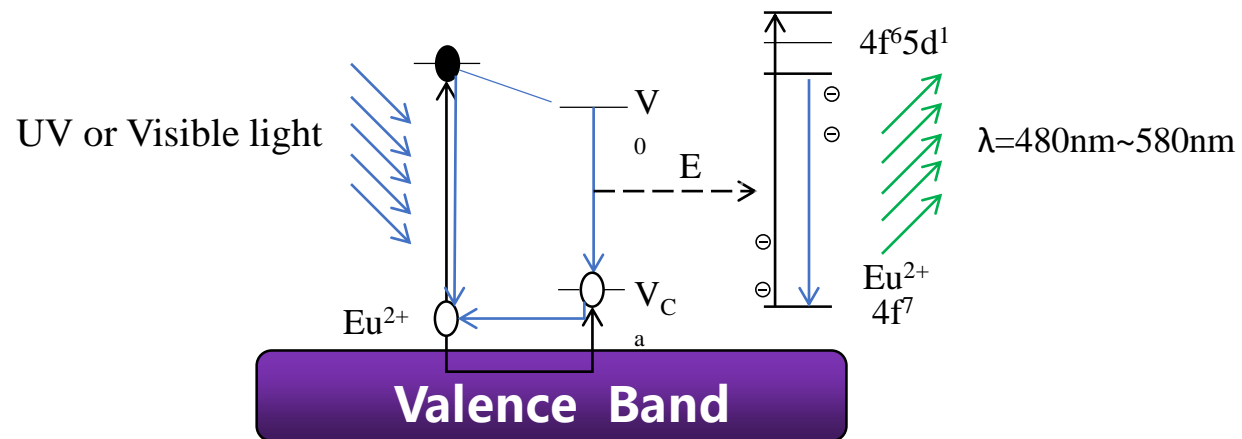
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Principle of illumination

Conduction Band



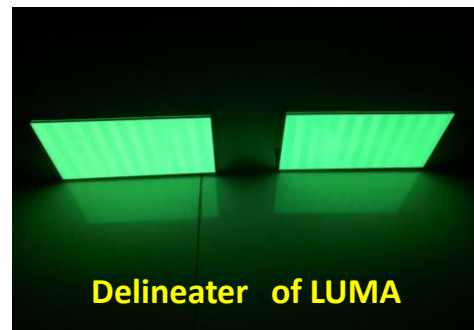
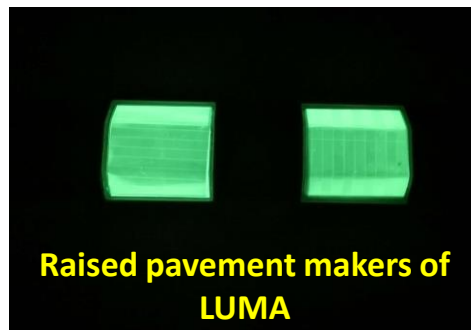
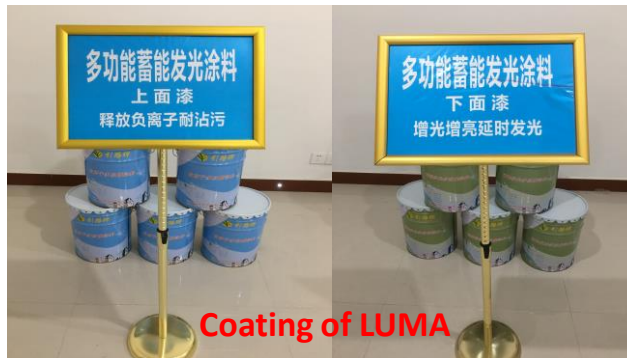
Sr_2AlO_4 Double-doped material electron capture and captured luminescence mechanism

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Product and Technology

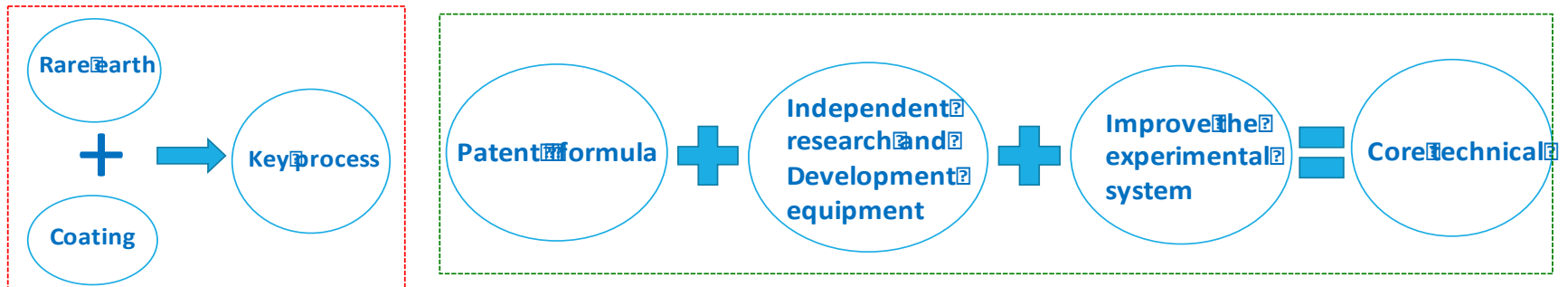


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Product and Technology



No.	Item Name	Authorization or Application Number	Country
1	A Design Method for Auxiliary Road Tunnel Lighting Based on Multifunctional Energy-Storage and Luminescent Materials (Patent Pending)	201510974296.1	China
2	A Green Lighting Method for Road Tunnels with Effective Utilization of Light Energy (Patent Pending)	201610945093.4	China
3	Lighting without Lamp Facilities based on Natural Light and Automobile Light (Patent Pending)	201711442283.5	China



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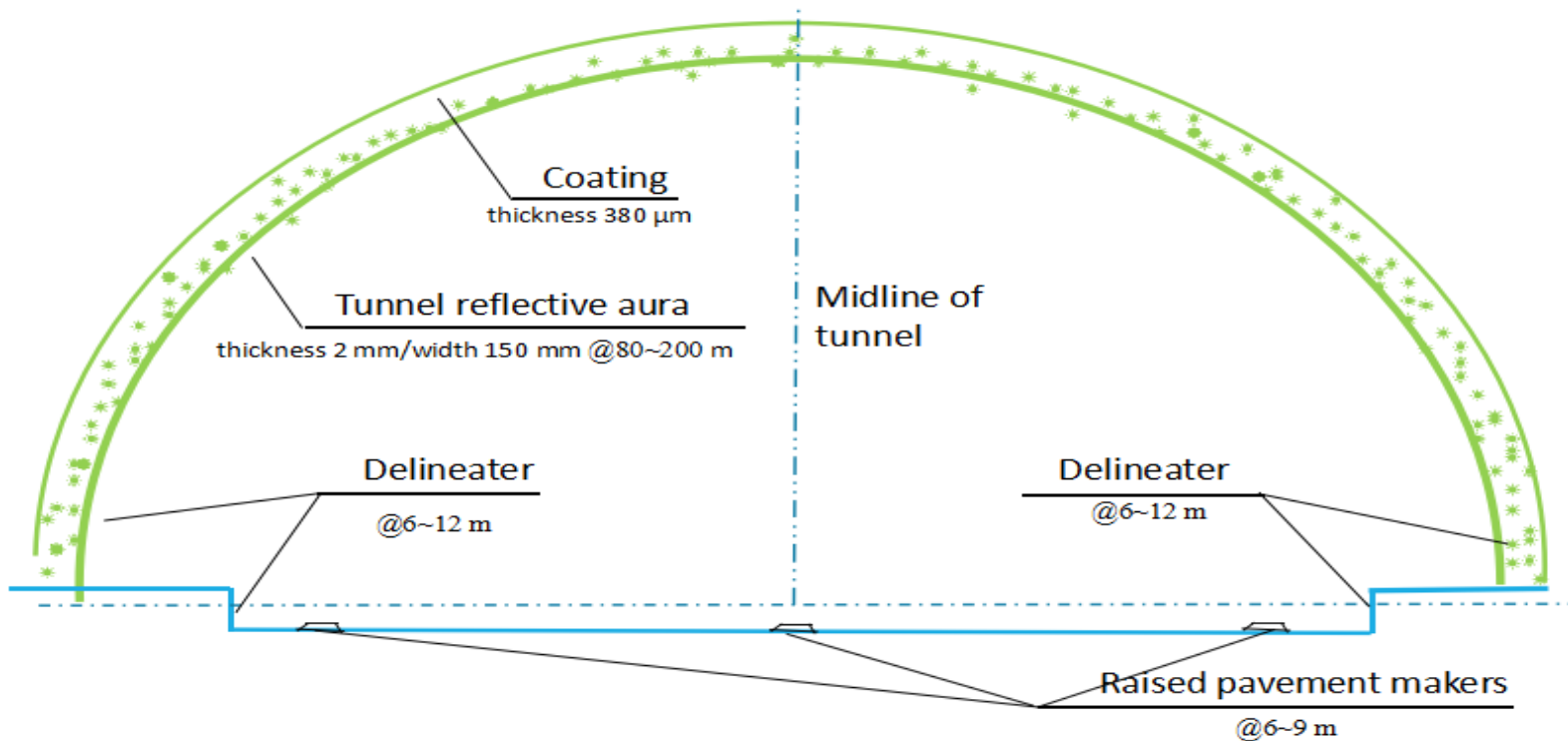
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Application Design



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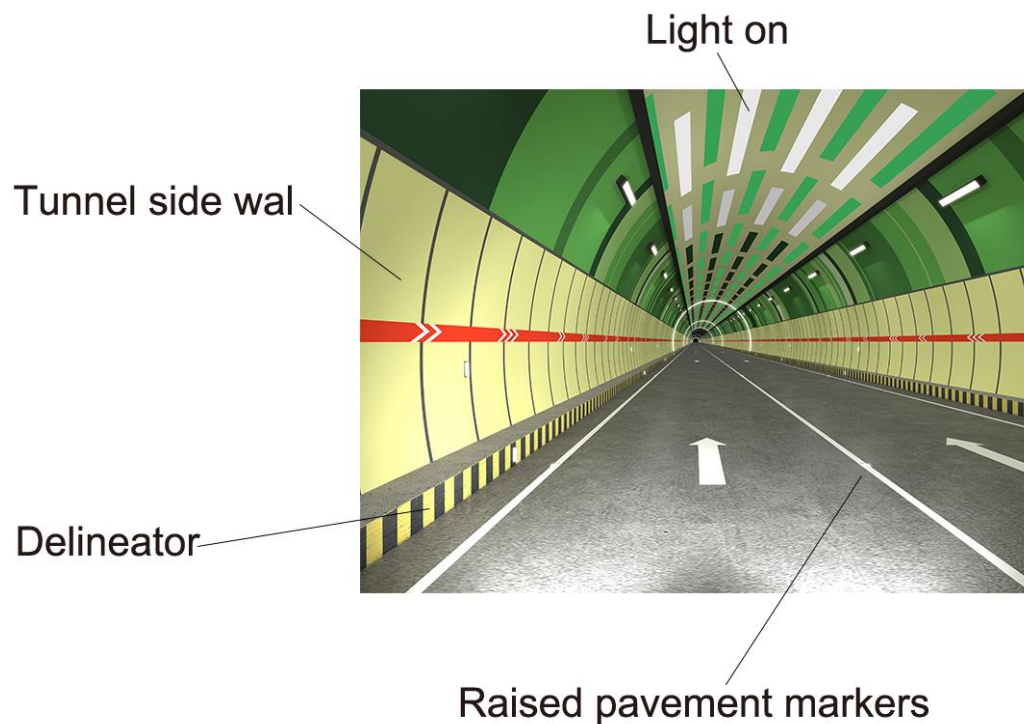
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Application Design



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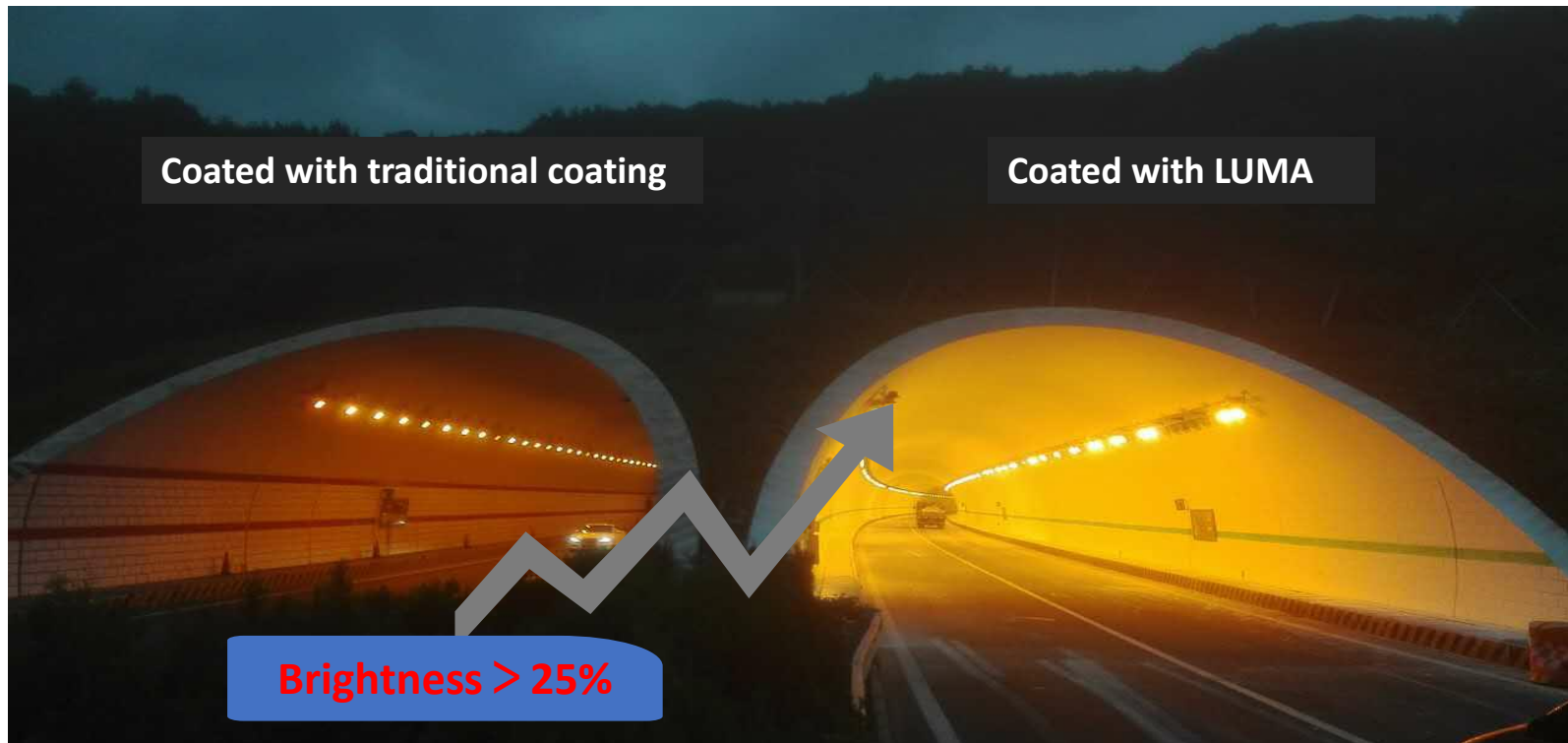
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Effect-----Brightening and brightening



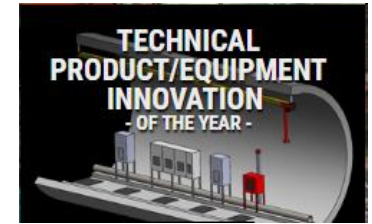
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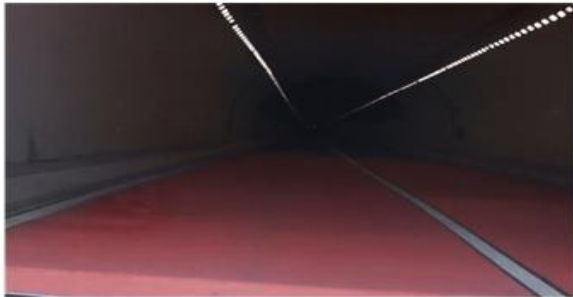
Effect ---- Eliminate the "black hole" and "white light"



(a) "Black hole" phenomenon



(b) "White light" phenomenon



(c) "Black hole" eliminated



(d) "White light" eliminated

When LUMA is set at the tunnel opening, and there is less contrast of light inside and outside the hole (exit). So it helps to reduce traffic accidents!

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Left hole : After decoration

Right hole : Before decoration



Significantly improved illumination uniformity reduces the probability of accidents caused by lack of visual reference illumination

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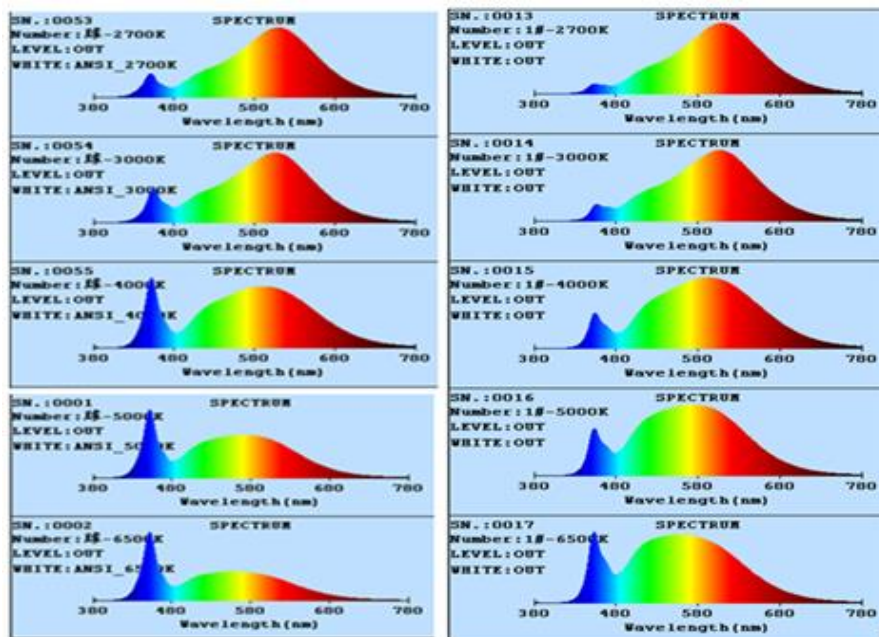
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Compensate light source gap
and increase visual distance



(a) Walls decorated with ordinary coating

(b) Walls decorated with multifunctional
energy-storage and luminescent materials

Test for spectrum wavelength change of light sources in
the spaces with different wall surfaces

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(a) 5000K, 80Lx



(b) 2500K, 80Lx



(c) 5000K, 410Lx



(d) 2500K, 410Lx

X
Visual effect in the same distance with light sources having
different color temperature and lighting brightness

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Effect----Strong light penetration

Coated with
LUMA

Coated with traditional coating

Coated with
LUMA

Coated with traditional coating

Light on

Light off

- 1) No other light source , Coated with LUMA , Increase the visible distance of smoke penetration by more than 3m
- 2) In the event of a fire , Its time-delay luminescence and smoke penetration ability can effectively guide escape .

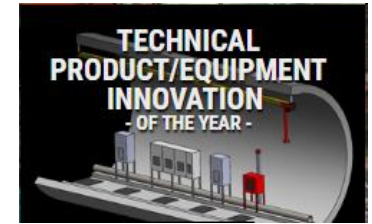
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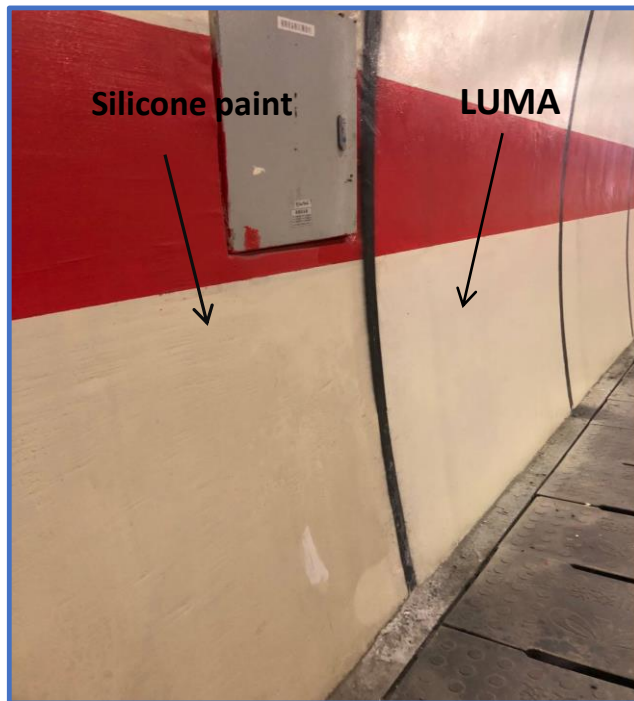
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Effect----High stain resistance



High stain resistance:

Compared with traditional tiles and other coatings, LUMA has higher stain resistance and is easier to clean, ensuring clean tunnel walls and easy maintenance management.



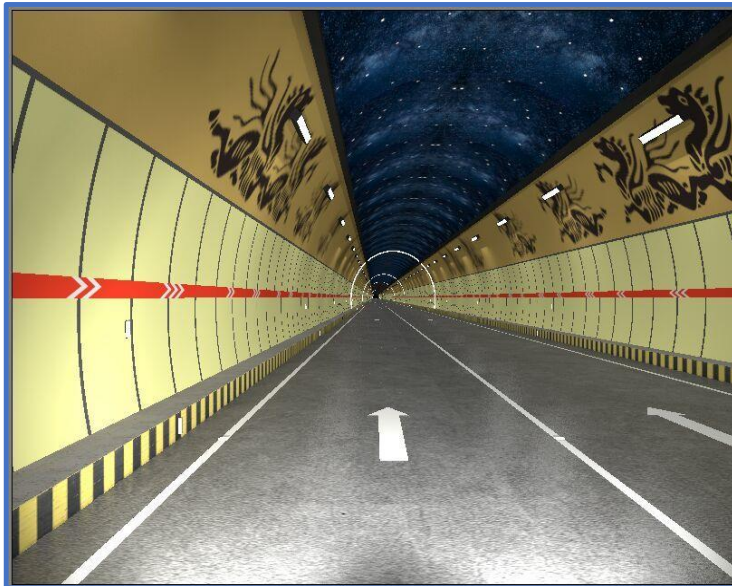
vide
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Effect----**LUMA** decorates the tunnel and relieves psychological stress



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Vide

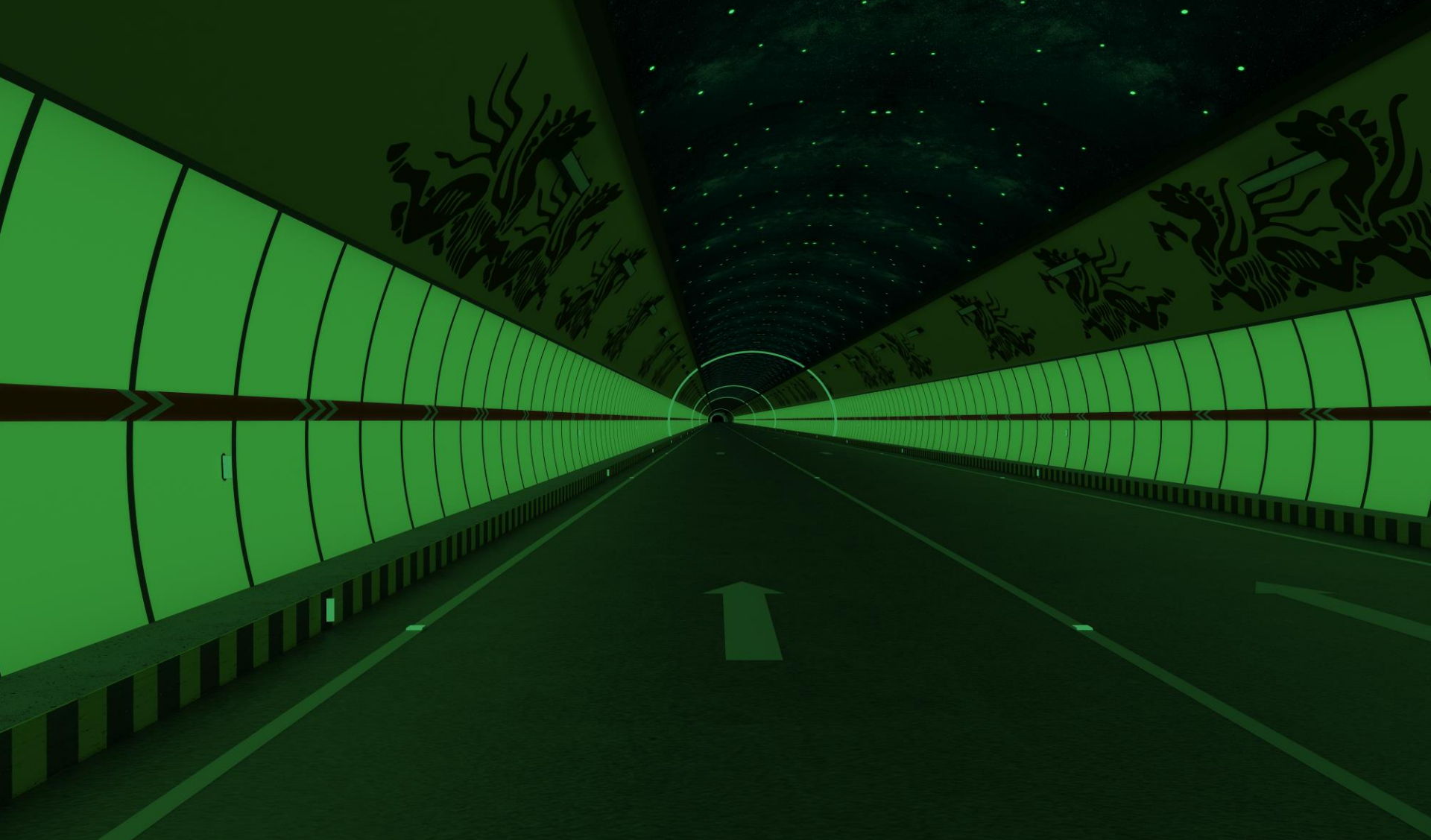
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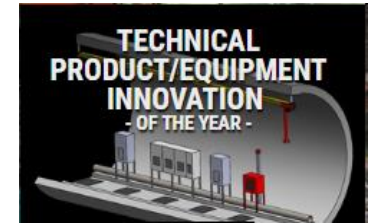
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TECHNICAL
PRODUCT/EQUIPMENT
INNOVATION





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Show cases --- Pathway in countryside



Green pathway



Use LUMA to create
a green tour, and to
beautify the road
environment while
playing the role of
no-lighting guidance!

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Problem

Safety ?
Health ?
Energy saving ?
Comfortable ?

Theory

Rare earth luminescent
materials and common
fluorescent materials
Is different

Effect

Brightening and
brightening、Auxiliary
emergency lighting、
Release negative ions
、 Light wave smoke、
Pollution resistant

Benefit

Save electricity costs of
150 million US dollars per
year; Ensure operation
safety, Reduce safety
accidents; purify air in
tunnels and reduce haze

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Benefits and social impact

Saving of energy cost (estimated potential of 1.5 billion dollars just in China)

Purify the air and reduce smog inside tunnel

LUMA improves tunnel operation safety and reduces the likelihood of accidents

Ensure the visibility distance for escape greater than 3 meters in case of fire

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THANKS!

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