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UNEP Collaborating Centre for Energy Efficient Lighting









Lighting technology development and trend

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Contents

Lighting technology status

Intelligent control in lighting

The development trend of lighting in future





Lighting technology status





Lighting technology status





Lighting technology status





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Lighting technology status







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Lighting technology status

LED packaging







Lighting technology status

LED Flip Chip



Flip Chip





Lighting technology status

Commonly used LED lighting products



LED downlight LED spot light LED panel lamp LED Tunnel lights

LED street lamp







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Lighting technology status

Commonly used LED lighting products



LED tube





Lighting technology status

LED filament bulb



incandescent lamp



Imitation of incandescent lamp





Lighting technology status

LED lamp Classification – by luminous flux

Classification Self-ballast LED lamp
150 lm
250 lm
500 lm
800 lm
1000 lm
1500 lm
2000 lm
3000 lm

IEC 62612 Ed.1 CDV GB/T 31112 2014





Lighting technology status

LED lamp Classification- different heat sink materials



Plastic

Aluminum

Ceramic



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Lighting technology status

LED lamp Classification-- different lamp bases







Lighting technology status

LED lamp structure





Lighting technology status

LED tube classification-- different sizes





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Lighting technology status











Driver

Lamp panel

Heat sink (Aluminum)

Lamp base







Lighting technology status

Luminous efficacy comparison

	Luminous Efficacy
Incandescent Iamp	≈15 Im/W
CFL	≈65 lm/W
LED bulb	≈70-75 lm/W
LED tube	≈90-100 lm/W







Lighting technology status

The main issue of LED lighting technology





LED technical bottleneck---heat radiation



Dr. Tang Dawei, The status and development trend of LED heat radiation technology, 2012



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LED technical bottleneck---heat radiation



Dr. Tang Dawei, The status and development trend of LED heat radiation technology, 2012



Lighting technology status

Typical heat radiation technologies

1. Section bar

2. Section bar+ air convection

3. Section bar + forced convection

4. Uniphase liquid cooling

5. Phase-Change cooling

6. Fine structure +phase-Change cooling [est Centre

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Dr. Tang Dawei, The status and development trend of LED heat radiation technology, 2012



Lighting technology status

Typical heat radiation technologies



Section bar

Section bar+ air convection

Phase-Change heat radiation

Dr. Tang Dawei, The status and development trend of LED heat radiation technology, 2012 e



Lighting technology status

Typical heat radiation technologies: examples



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Lighting technology status

New LED heat radiation technologies

Electro Hydro Dynamic

Polycrystalline diamond composite

Infrared radiation coatings





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Intelligent control in lighting



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Intelligent control in lighting

What is control protocol?





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Intelligent control in lighting

Wi-Fi









Zigbee

Intelligent control in lighting







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Bluetooth



Intelligent control in lighting







Intelligent control in lighting





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Intelligent control in lighting

Intelligent control protocol in LED lighting



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Intelligent control in lighting

NEP

Intelligent control protocol in LED lighting





The development trend of lighting in future

The trend --- Lighting system





The development trend of lighting in future

The trend --- Human centric









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The trend --- Human centric





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