The Cosmic Agricultural Film
User Manual

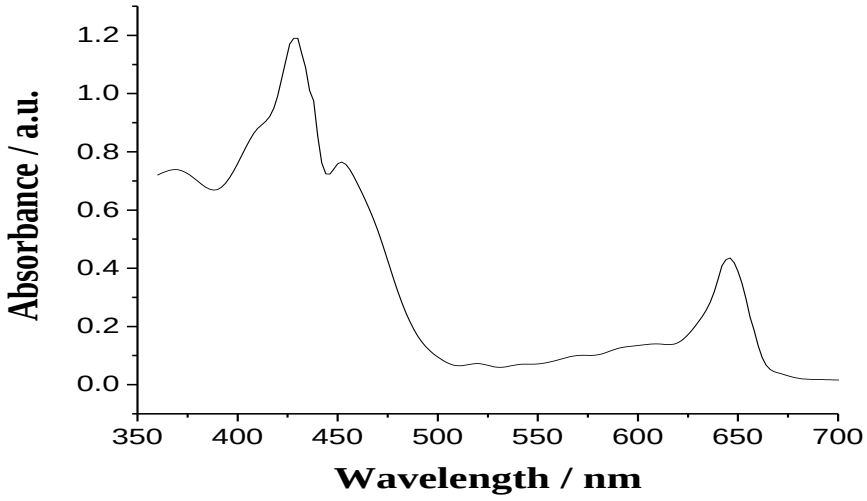
The majority of agricultural plastic films of greenhouse farming in the market exhibit features such as aging resistance, drip prevention, fog resistance, and heat retention. However, these features passively harness solar energy without considering the active manipulation of sunlight wavelengths. The Cosmic agricultural film that we have researched incorporates this concept into its design. It is formulated to absorb harmful ultraviolet and ineffective green light from sunlight, subsequently converting them into beneficial blue and red light conducive to plant growth. The primary objective is to enhance plant growth rate, hasten maturity, and increase yields.

1. Impact of Sunlight on Plant Growth

Sunlight covers a spectrum ranging from 200 nanometers to 1,200 nanometers, and empirical evidence has shown:

a) Ultraviolet light (280~400nm) - harmful to plants.
b) Blue light (400~500nm) plays an extremely crucial role in the growth of plant leaves and roots.
c) Green and yellow light (500~600nm) contribute relatively little to photosynthesis in plants and can inhibit chloroplast activity.
d) Red light (600~700nm) benefits stem and fruit growth, promotes flowering, and facilitates chlorophyll formation in plants.
e) Infrared light (800~1,200nm) primarily generates heat.

2. The absorption spectrum of chlorophyll



From the absorption spectrum of chlorophyll, it can be observed that the central wavelengths of the absorption peaks are 430 nanometers and 640 nanometers. This indicates that photosynthesis in plants primarily harnesses the blue and red light from the sun.

3. Products

Type	Model	Function	Excitation Wavelength Range (nm)	Emission Wavelength Peak (nm)	Emission Wavelength Width (nm)	Relative Brightness (%)
Organic	ZKNY-01	Purple to Red	240~400	620	30	130
	ZKNY-02	Purple to Blue	280~410	450	112	120
Inorganic	ZKNW-01	Purple to Red	250~380	630	32	80
	ZKNW-02	Purple-Green to Red	250~310, 485~560	650	120	200
	ZKNW-03	Purple to Blue	220~380	448	100	80

4. Product features

a. Organic Cosmic Agricultural Film Powder:
   - UV to Blue Light Conversion Powder - No similar product found in the market.
   - UV to Red Light Conversion Powder - Our product exhibits over 20% higher brightness compared to market alternatives, boasts high resistance to aging, and is competitively priced.

b. Inorganic Cosmic Agricultural Film Materials:
   - UV to Blue Light Conversion Materials - No similar product found in the market, with brightness 50% higher than organic alternatives.
   - UV to Red Light Conversion Materials - No similar product found in the market, with brightness 50% higher than organic alternatives.
   - Purple-Green to Red Light Conversion Materials - Our product enhances brightness by over 200% compared to market alternatives, while remaining cost-effective.

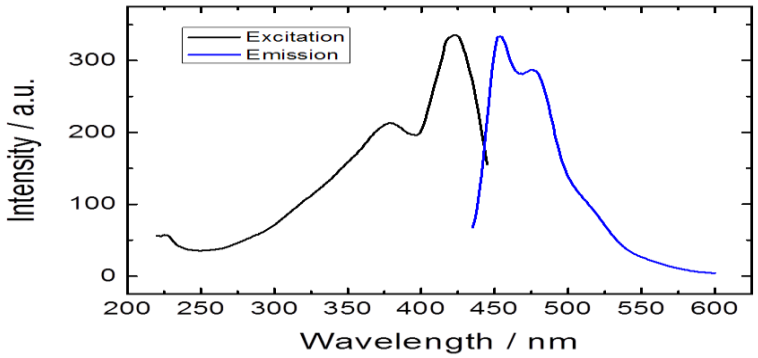
c. Organic vs. Inorganic Comparison:
   - Organic powders offer superior brightness, exhibiting brightness levels 200-400% higher than inorganic counterparts.
   - Inorganic light-converting materials demonstrate excellent aging resistance, with a lifespan of over 10 years without degradation. In contrast, organic powders have poorer aging resistance and may lose effectiveness in 2-3 years under sunlight exposure.

d. This product possesses UV resistance capabilities, enhancing the aging resistance of agricultural films. With the addition of this product to agricultural films, there is no

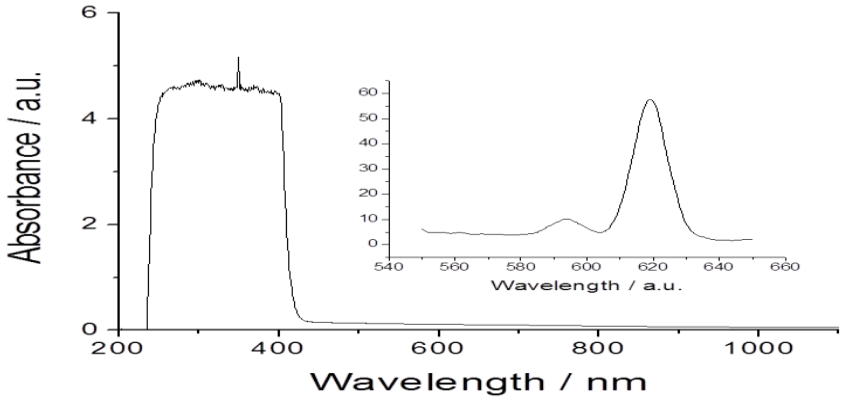
need for additional UV-resistant agents.

5. Product excitation spectra

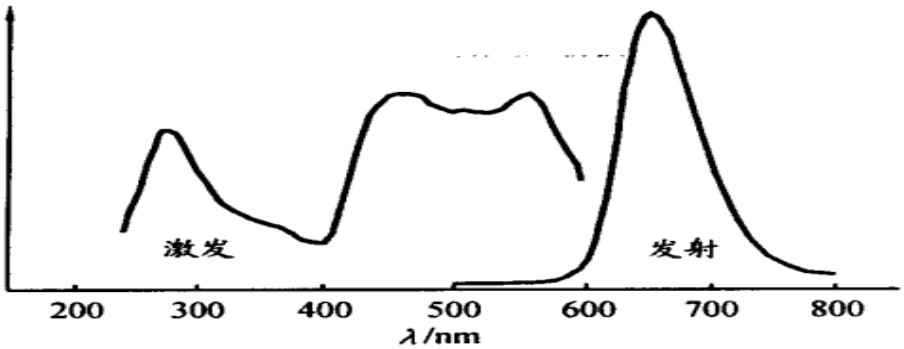
a. Excitation Spectrum of Purple-to-Blue Agricultural Film.



b. Excitation Spectrum of Purple-to-Red Agricultural Film.



c. Excitation Spectrum of Green-to-Red Agricultural Film Material.



Excitation Spectrum Emission Spectrum

6. Advantages of the Cosmic Agricultural Films:

a. **Photo-Thermal Effect:**
The light intensity and transparency inside Comic film greenhouses are higher than conventional films, resulting in elevated greenhouse temperatures (refer to Table 1). **This leads to an average yield increase of 20-30%**.

Table 1: Crop Yield Enhancement Effects of the Cosmic Agricultural Films

Test Film	Control Film	Transparency Increase (%)	Greenhouse Temperature Rise (℃)	Crop Yield Increase
PVC Cosmic Film	PVC Standard Film			Cucumber 15%
PE Anti-Aging Dripless Cosmic Film	PE Standard Film		3~5°C	Crop 10~50%
PVC Cosmic Film	PE Standard Film		2~5°C	Crop 15~30%
PVC Cosmic Film	PE Long-Life Dripless Film	8%		Garlic Chives 38.5%, Tomatoes 14.8%
PE Aging-Resistant Cosmic Film	PE Aging-Resistant Film		2.7~4.5°C	Crop 9.3~22.2%
PE Aging-Resistant Cosmic Dripless Film	PE Standard Film	4-10%	0.3~1.9°C	Tomatoes 16.1%, Eggplant 12.2%
PE Weather-Resistant Cosmic Dripless Three-Layer Coextruded Film	PE Long-Life Dripless Three-Layer Coextruded Film	3.28%	1~3°C	Crop 8~14%

b. **Biological Effect:**
High-tech Cosmic film greenhouses are more conducive to crop growth and development. They promote the absorption of essential nutrients like nitrogen, phosphorus, and potassium by crops. This results in increased leaf area, expansion, plant height, stem length, and higher chlorophyll content in leaves, leading to higher levels of photosynthesis products (soluble sugars, starch, proteins, etc.) in leaves (refer to Table 2).

Table 2: Photo biological Effects of High-Tech Light-Converting Agricultural Films

Test Item		Light-Converting Film vs. Standard Film	Weather-Resistant Light Conversion Dripless Film vs. Long-Life Dripless Film
Transparency Increase (%)		5~15%	3.28% (average)
Greenhouse Temperature Rise (°C)		1~3°C	1~3°C (average 1.57°C)
Crop Nutrient Absorption Rate (average)			
	N (Nitrogen)	6.91%	6.01%
	P (Phosphorus)	0.33%	0.58%
	K (Potassium)	0.87%	2.35%
Leaf Chlorophyll Content Increase (average)		13.08%	5.94%
Tomato Leaf Photosynthesis Products Increase			
	Soluble Sugars	14.3%	14.63%
	Starch	14.0%	14.65%
	Proteins	5.5%	7.41%
Crop Yield Increase (%)		5~14%	8-14%
Fruit Quality	Sugar Content	(Strawberries) 7.93%,	(Watermelons) 4.65%,
	Vitamin C	(Strawberries) 18.8%	(Watermelons) 18.18%
Economic Benefit (Input-Output Ratio)		1:2.8 ~ 1:12	1:3.9 ~ 1:7.2

c. **Yield Increase Effect:**
When compared to control films, crops inside high-tech light-converting film greenhouses exhibit higher yields, especially during the early stages of crop production, and can bring crops to market 5-7 days earlier.

d. **Economic Effect:**
Our experiments indicate that, for a greenhouse measuring 9 meters wide and 160 meters long, requiring 100 kilograms of agricultural film with a 2-year lifespan and an additional investment of 300 yuan, the input-output ratios for high-tech light-converting films compared to standard films are as follows for the mentioned crops: Eggplant 1:2.8, Tomato 1:7.6, Cucumber 1:11.3, Strawberry 1:61. When comparing weather-resistant light conversion dripless films to long-life dripless films, the ratios are: Eggplant 1:3.90, Tomato 1:4.35, Cucumber 1:4.13, Strawberry 1:7.15. **This indicates that the average input-output ratio reaches 1:3-1:6, showing significant economic benefits.**

e. **Quality Effect:**
The vitamin C and sugar content in the fruits of crops grown inside high-tech light-converting film greenhouses are higher compared to those in control films. Additionally, it increases the percentage of large fruits, reduces small fruit percentages, and decreases deformed fruit percentages.

f. **Disease Resistance Effect:**
With the reduction in ultraviolet light transmission inside high-tech light-converting film greenhouses, crop diseases such as leaf withering and yellow wilt are reduced **by approximately 2%.**

g. **Aging Resistance Effect:**
Ultraviolet light can accelerate the aging and damage of agricultural films. The light-converting materials added to light-converting agricultural films have the characteristic of absorbing ultraviolet light and preventing its transmission. Therefore, experiments have shown that light-converting films have certain aging resistance effects.