

# **CORESTA SSPT2021**

**Preparation of cigarette packet blanks with high barrier  
and its moisture retention, moisture resistance and  
flavor keeping performance**

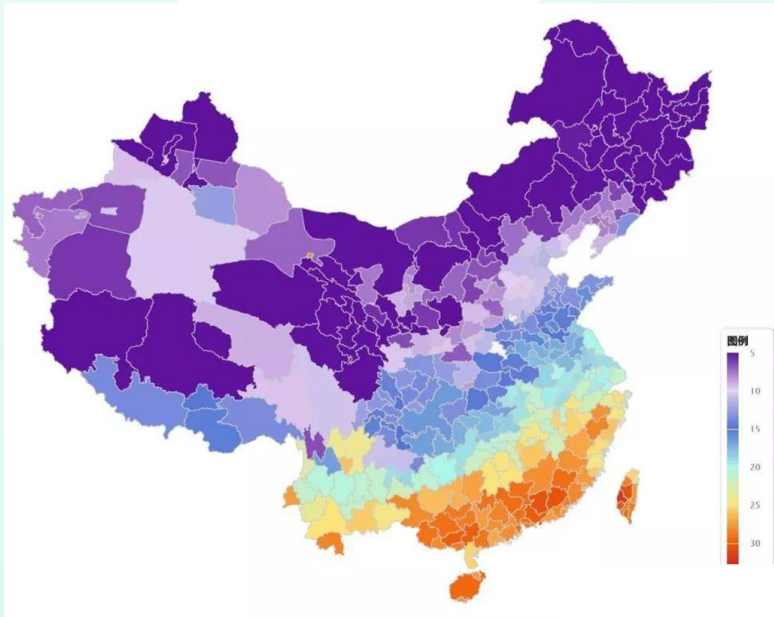
**Presenter: Xiaoying Ji  
From China Tobacco Sichuan Industrial Co., Ltd.**

# 1、Background



中国烟草  
CHINA TOBACCO

The physical moisture retention of cigarette products in different environments is an important factor affecting the sensory quality.



The temperature and humidity vary greatly in different regions:

Temperature: -15-40 °C    Humidity: 15 %-95 % RH



The dry environment

Moisture loss problem.  
Cigarette smoke is dry, and irritating to the throat.

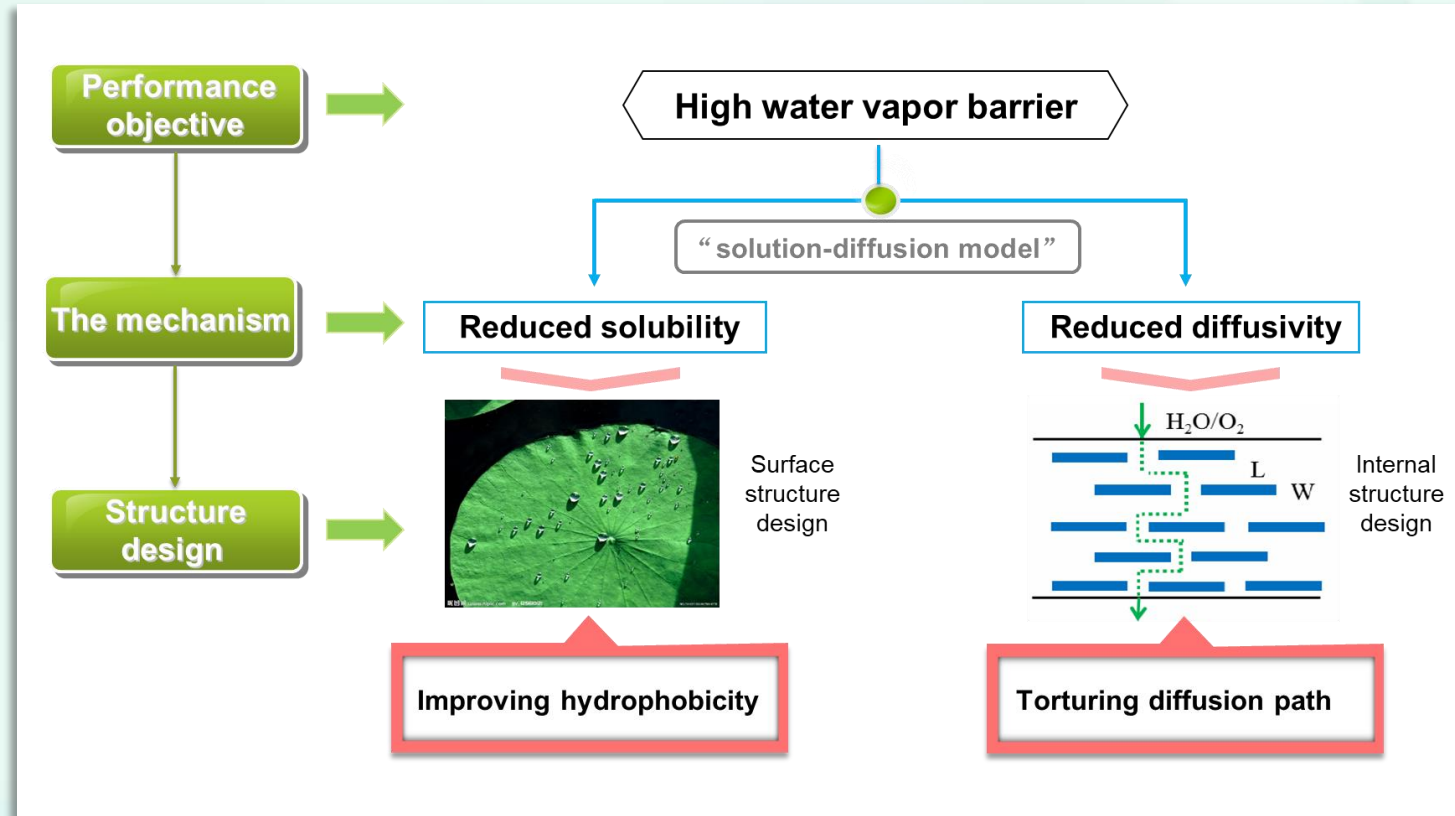
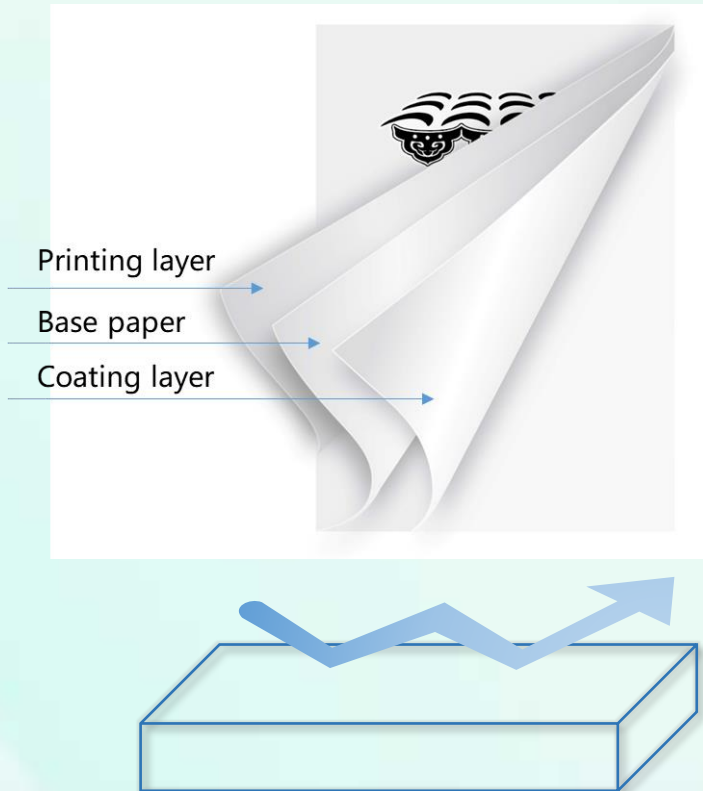


The humid environment

Moisture absorption problem.  
The flavor decreased.  
Cigarette is liable to mildew.

# 1、Background

A biodegradable coating with high barrier property was coated onto the cigarette packet blanks, reducing the moisture content changes during storage process.



## 2、 Research Progress

A series of polyvinyl alcohol (PVA) / glycerol tristearate (GTS) emulsions were prepared as surface coatings.

S1 represents the uncoated packet blank; S2-S5 represents the coated packet blanks; coating emulsions of S2-S5 have different GTS contents, which is followed by 0wt %, 20wt %, 40wt % and 60wt %.

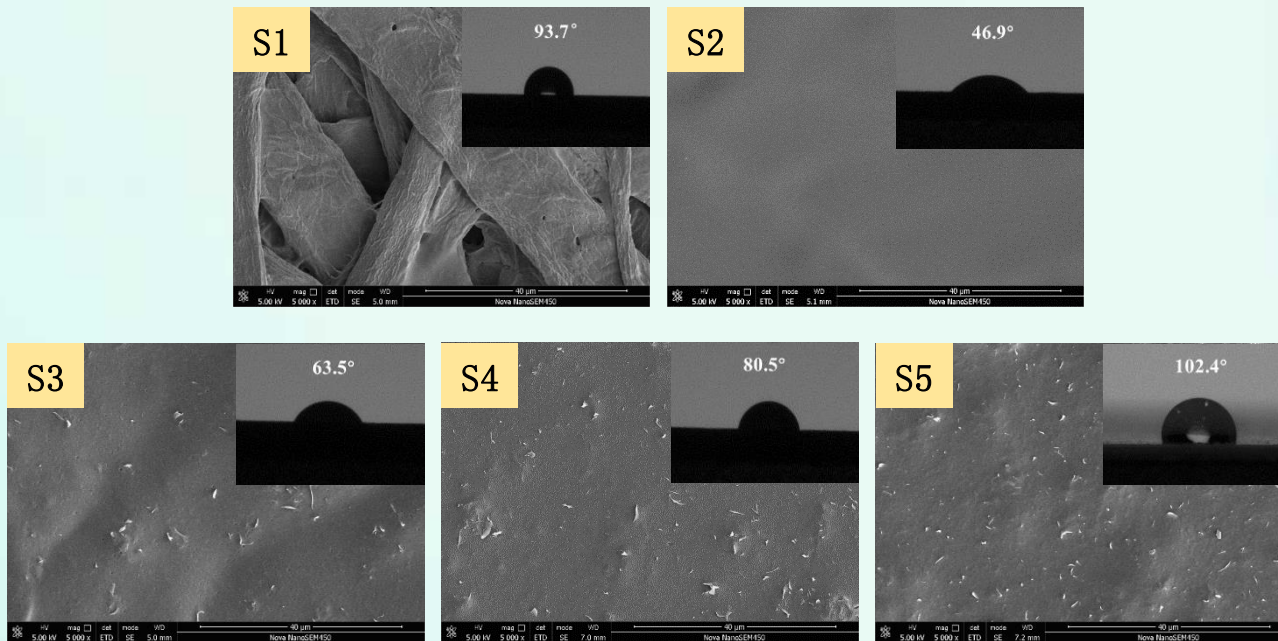


Fig. 1. The SEM images and water contact angle of different samples.

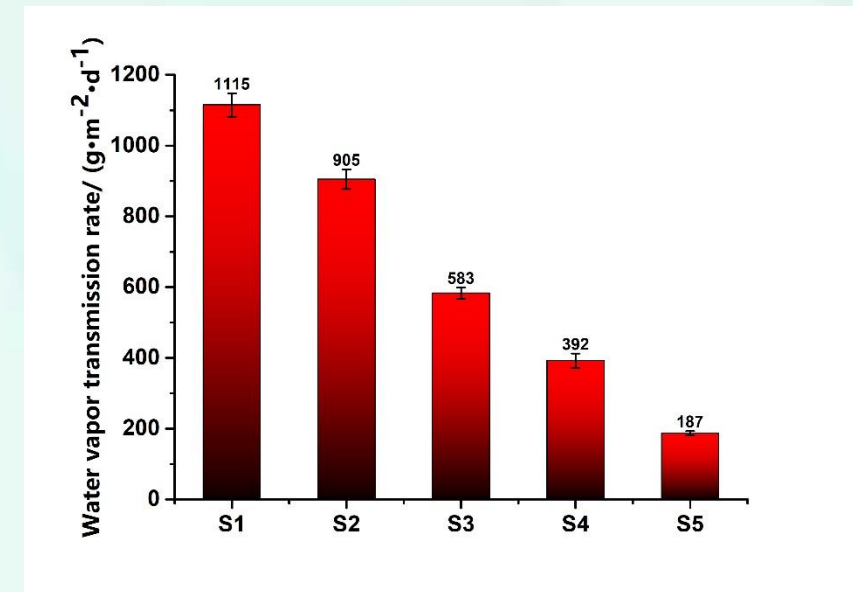


Fig. 2. The water vapor transmission rate.

## 2、 Research Progress

The effect of barrier property on the cigarette moisture retention was tested by using Glove Boxes system.

Enhancing the barrier property, the moisture loss of cigarettes in a dry environment decreases gradually.

**The total moisture loss of sample S5 decreased by 16.81 % compared to sample S1.**

Glove Boxes: temperature — 22 °C  
humidity — 30 % RH

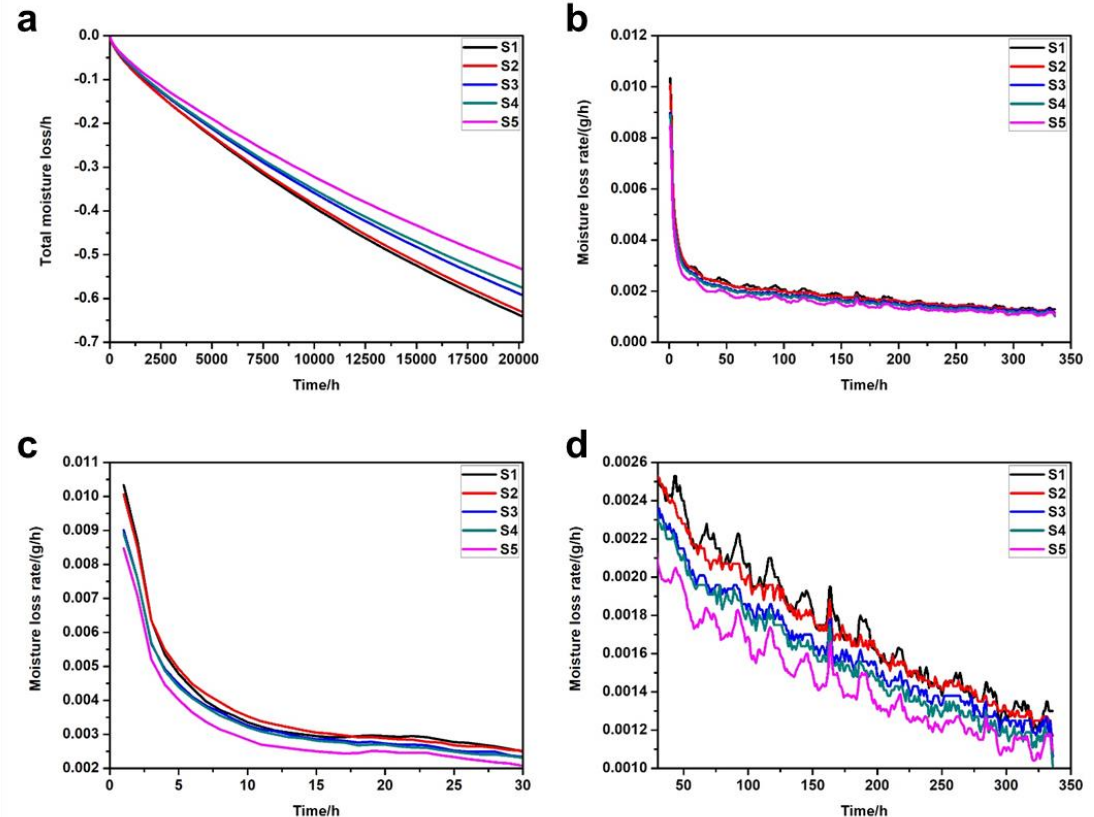


Fig. 3. (a) the total moisture loss; (b-d) the moisture loss rate.



## 2、 Research Progress

### Moisture ratio (MR)

Represents the rate of moisture loss under certain drying conditions

$$MR = \exp\left[-\left(\frac{t}{\alpha}\right)^\beta\right] \quad \text{Weibull function}$$

t is time;  $\beta$  is the shape parameter;  $\alpha$  is the scale parameter, which represents the rate of the change of MR over time.

**The higher the  $\alpha$  is, the slower the moisture loss rate and the better the moisture retention performance.**

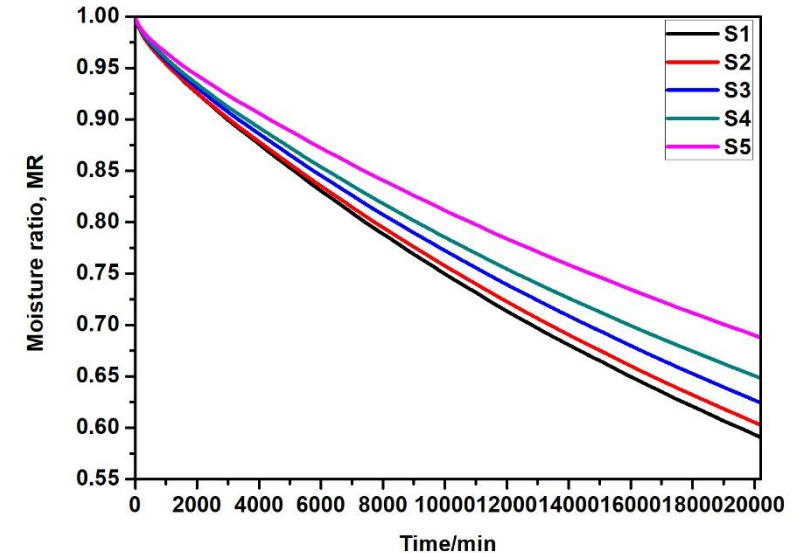


Fig. 4. the moisture ratio of different samples.

Table. 1. Weibull fitting results of different samples.

Samples	$\alpha$		$\beta$		Weibull fitting results		
	value	SE	value	SE	$R^2$	$SSR \times 10^{-4}$	$\chi^2 \times 10^{-4}$
S1	717.817	0.960	0.854	0.001	0.9998	7.55	4.23
S2	760.253	1.333	0.844	0.001	0.9997	11.19	3.96
S3	829.837	1.431	0.843	0.001	0.9998	8.64	3.54
S4	930.430	1.408	0.827	0.001	0.9998	5.03	3.08
S5	1113.939	1.811	0.826	0.001	0.9998	3.73	2.43

**Enhancing the barrier property, the  $\alpha$  increases gradually; the sample S5 has the largest  $\alpha$  value, which is 55.18 % higher than that of S1.**

## 2、 Research Progress

The moisture resistance performance was measured in the constant temperature and humidity equipment (temperature is 30 °C, relative humidity is 80 % RH).

A regular cigarette weight testing was conducted.

Enhancing the barrier property, the moisture absorption of cigarettes in a humid environment decreases gradually.

**The total moisture absorption of sample S5 decreased by 18.03 % compared to sample S1.**

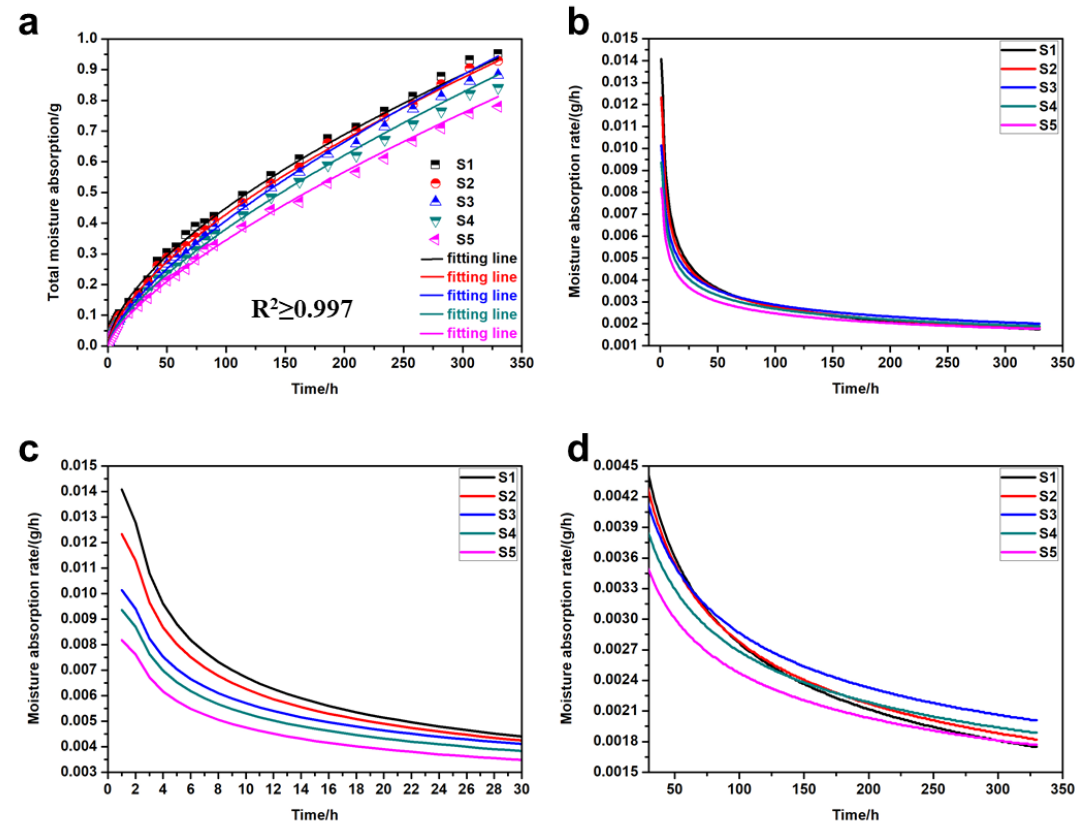


Fig. 5. (a) the total moisture absorption; (b-d) the moisture absorption rate.

## 2、 Research Progress

**Dry environment: compared to S1, the change of moisture content (dry basis) of cigarette packet blanks, filter and cut tobacco of S5 decreased by 6.86 %, 12.11 % and 6.37 %, respectively.**

**Humid environment: compared to S1, the change of moisture content (dry basis) of cigarette packet blanks, filter and cut tobacco of S5 decreased by 7.22 %, 10.08 % and 15.92 %, respectively.**

Table. 2. Change of moisture content (dry basis) during two-week storage in dry environment.

Sample	Change of moisture content (dry basis) during two-week storage in dry environment/%		
	Cigarette packet blank	Filter	Cut tobacco
S1	-22.35	-16.80	-29.53
S2	-18.53	-12.54	-27.50
S3	-18.66	-9.02	-28.13
S4	-18.93	-8.25	-26.11
S5	-15.49	-4.69	-23.16

Table. 3. Change of moisture content (dry basis) during two-week storage in humid environment.

Sample	Change of moisture content (dry basis) during two-week storage in humid environment/%		
	Cigarette packet blank	Filter	Cut tobacco
S1	34.46	14.38	49.78
S2	37.71	12.78	50.24
S3	35.15	10.30	35.57
S4	27.80	7.24	33.30
S5	27.24	4.30	33.86



# 2、 Research Progress

Enhancing the barrier property of cigarette packet blanks, flavor keeping performance of cigarette products was significantly improved.

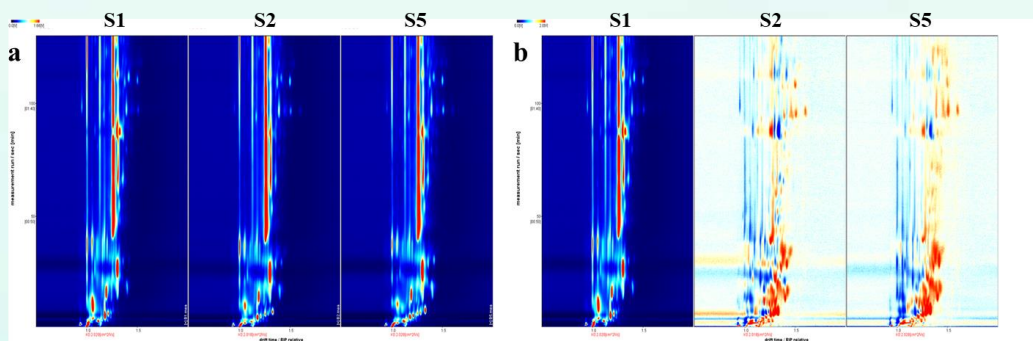


Fig. 6. GC-IMS spectra of samples in dry environment.

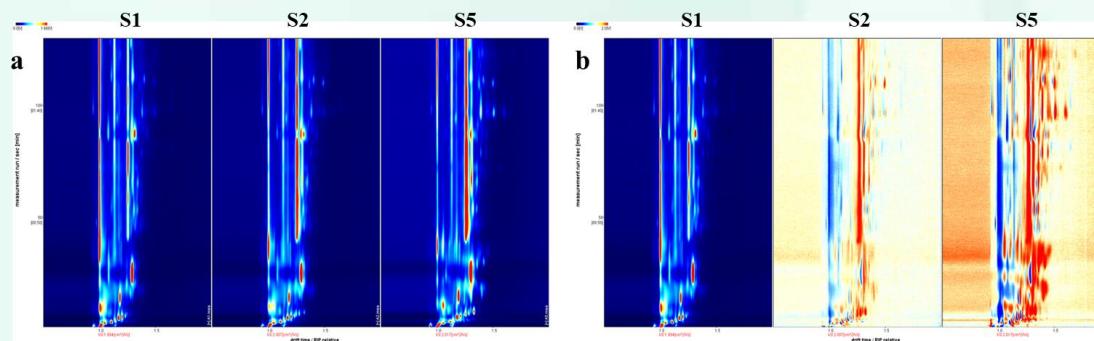


Fig. 7. GC-IMS spectra of samples in humid environment.

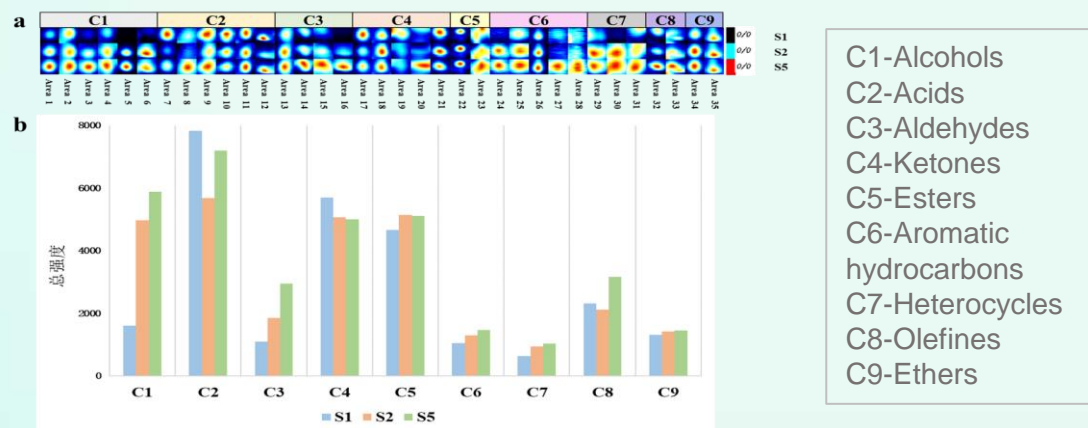


Fig. 8. Fingerprint chromatograph and ionic strength by GC-IMS.

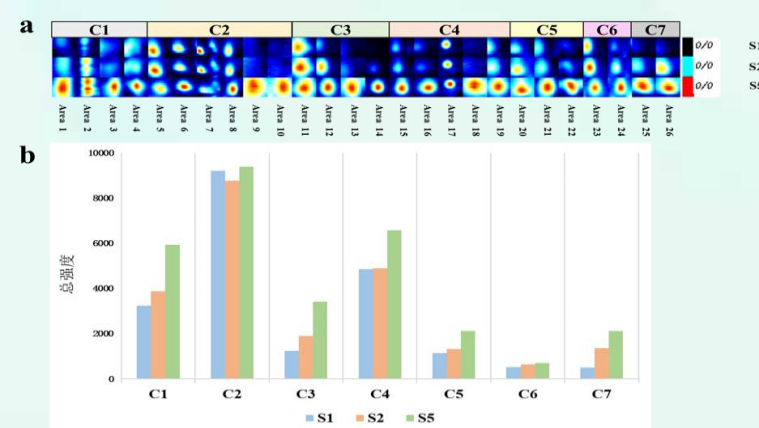


Fig. 9. Fingerprint chromatograph and ionic strength by GC-IMS.

# 3、 Conclusion

## 01 An eco-friendly coating with high water vapor barrier was prepared.

Compared with the uncoated blanks, the water vapor transmission rates of coated blanks significantly decreased with the largest drop of 83.23 %.

## 02 The coatings can improve moisture retention and moisture resistance of cigarette.

Under the same conditions, the total moisture loss in a dry environment and the total moisture absorption in a humid environment of cigarettes packed in a packet with a coated blank decreased by 16.81 % and 18.03 %, respectively.

## 03 The flavor keeping performance and sensory quality of cigarettes were enhanced.

Coating the high barrier layer to the cigarette packet blanks, the flavor keeping performance and sensory quality of the cigarettes can be improved obviously. According to the sensory evaluation, the smoke is well-balanced, mellow and delicate, with rich aroma and clean finish.

# **CORESTA SSPT2021**

**Thank you for listening!**

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