

## Languang Participating International Data Comparison of Permeation Test

### 1. Background

The microcosmic property of its test object, which resulted in fluctuate factors of permeation test data, has made permeation test prominently different from other physical indexes test. That is why the issue of whether test data of the instruments can be compared with that of other manufactures and labs has always been one of the focused concerns of its users.

Languang has attached great importance to data comparison of permeation test since it set its foot in the work of permeation test in 2001. When the first set of permeation test instruments BTY-B1 and TSY-T1 were introduced into market, Labthink has already conducted a great deal of data comparison with many famous domestic institutions of permeation test. Among that, certain foreign brand has been involved in the comparison instruments. In 2002, in order to carry on long-term data comparison, Languang lab was constructed. Moreover, with an aim to carrying out data comparison of different test method accurately and to getting firsthand data materials, Lathink began to develop permeation test instruments that can adopts many testing method since 2003 and has put out VAC-V1 and TSY-T3 with stronger test functions on the basis of BTY-B1 and TSY-T1. The comparison result shows that there is certain comparability between the test data of Languang and that of other test institutions.

As Languang constantly further its research in permeation test, it gradually introduced the permeation products series such as gas permeation testers VAC-V1 and TOY-C1 as well as water vapor permeability testers TSY-T2 and TSY-T3. At the same time, Languang is continuously improving the condition and precision of data comparison. In order to carry out data comparison accurately and comprehensively and to understand the data system of permeation test in the international market in an all-round way, Languang has make international data comparison as one of its important tasks in 2004.

### 2. Languang's cooperation with German

Since September 2004, Labthink began to contact with Thailand package center and German Mecadi Lab, who entrusted Labthink with its lab work. Trough comparison test of nearly half a year, the data comparison of international permeation test organized by Mecadi has finished successfully. It is the first time that Labthink participating in international permeation data comparison.

Three kinds of standard film A, B, C, of unknown material with a thickness of  $80\mu\text{m}$ ,  $100\mu\text{m}$ ,  $500\mu\text{m}$  respectively (the measured thickness of standard film C is  $460\mu\text{m}$ ), are offered to Labthink by Mecadi laboratory successively in two times. Oxygen permeation test of these film are required to be performed under a test condition of  $23\text{ }^{\circ}\text{C}$  and  $0\% \text{ RH}$  using differential pressure principle.

### 3. Data Comparison of Labthink

Mecadi provided the standard film in two times; therefore data comparison of Labthink is publicized in two times.

Datasheet for the first time see table 1.

**Table 1. Test result of standard film A**

Sample	A ( 80 μ m )		
Test times	1	2	3
Temperature	23.0	23.1	23.0
O <sub>2</sub> GTR mL/m <sup>2</sup> · 24h · 0.1MPa	20.032	19.17	19.177
Permeation coefficient cm <sup>3</sup> · cm/cm <sup>2</sup> · s · cmHg	2.4 × 10 <sup>-12</sup>	2.3 × 10 <sup>-12</sup>	2.3 × 10 <sup>-12</sup>
Diffusion coefficient cm <sup>2</sup> /s	1.3 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>
Solubility coefficient cm <sup>3</sup> /cm <sup>2</sup> · s · cmHg	1.9 × 10 <sup>-3</sup>	1.9 × 10 <sup>-3</sup>	2.1 × 10 <sup>-3</sup>

Datasheet for the second time see table 2

**Table 2. Test result of standard film A , B , C**

Sample	Test item and unit	Test result
A (80 μ m)	O <sub>2</sub> GTR cm <sup>3</sup> /(m <sup>2</sup> · 24h · 0.1Mpa)	16.422
B (100 μ m)	O <sub>2</sub> GTR cm <sup>3</sup> /(m <sup>2</sup> · 24h · 0.1Mpa)	10.491
C (460 μ m)	O <sub>2</sub> GTR cm <sup>3</sup> /(m <sup>2</sup> · 24h · 0.1Mpa)	385.923

we can get that the average value of O<sub>2</sub>GTR 18.700 mL/m<sup>2</sup> · 24h · 0.1MPa by calculating. Standard deviation is 1.572 and data fluctuation percentage is 8.405 %. Generally speaking, stability of the test data is comparatively well.

#### 4. Comparison result

Besides Labthink, there are four other labs participating the data comparison. With a consideration of impartiality and protecting other labs, Mecadi Lab didn't reveal relating information about other labs to Labthink. Detailed test results of standard film A about all the five labs are listed in table 3.

**Table 3. comparison data of standard film A (80 μ m )**

Lab	Oxygen permeability Nm <sup>3</sup> · mm/m <sup>2</sup> · h · bar	Temperature
Labthink	6.48E-08	23 °C
	6.21E-08	
	6.21E-08	
	5.21E-08	
Lab I	7.55E-08	
	5.30E-08	
	5.21E-08	
Lab II	1.15E-07	25 °C
Lab III	4.72E-08	(Lit.)
Lab IV	6.79E-08	
Medium Value	6.52E-08	

Note: this table use Lab I , Lab II , Lab III, Lab IV to represent other four labs.

From the result we can see that test result of Labthink features good stability and small fluctuation. More over, measured data of film A, B, C are all within standard range and its test data in the four times as well as its average value are extremely close to

the average value of the whole test data. Thus Labthink got a high evaluation from Mecadi: your manometric measurement shows good results.

## 5. Conclusions

Stability and dependability of test data are the two most important indexes for the performance of test instruments. The long-term test has proved that the test data of Labthink permeation instrument features a good stability. With its proved data reliability, test data of Labthink has a good comparability with that of other permeation labs. Based on all that strengths, Labthink is now progressively enhancing its international competitiveness.