

## **The Research for Rapid Fetermination of Aldehyde Volatile Compounds in Whole Doors by Aas Chromatography**

Shuai Hu, Zhengbing Zhu, Yusheng Jia, Jing Gao, Zheheng Zheng, Mengchuan Lv,  
and Jiankang Xu

Yongkang Research Institute of Quality and Technology Monitoring Yongkang 321300, China  
\*710052091@qq.com

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### **Abstract**

The gas chromatography analysis method of aldehyde volatile compounds is established. Through the random purchase of security door, woody fire door and other products from the market, using homemade "whole door free formaldehyde collection machine" to collect and release gas, which was dissolved in water through the pore diameter of 0.45 m machine filter film filtration, using gas chromatograph sample test, the study found: 1.from the random selection of security door, fire door, wooden door on the market have a certain degree of volatile aldehyde gas; 2.security door, wooden fire door three volatile aldehyde gases for formaldehyde, acetaldehyde, acrolein, butyl; 3.the fire door formaldehyde content is the highest.

### **Keywords**

Gas Chromatography; Aldehyde Volatile Compounds; Doors.

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## **1. Introduction**

Aldehyde volatile compounds are recognized by the World Health Organization as allergic reaction sources and are one of the potential potent mutants, [1].Formaldehyde is mainly absorbed by human body through respiratory system. Data show that when formaldehyde concentration in indoor air is 0.06mg/m<sup>3</sup>~0.07mg/m<sup>3</sup>, children feel unwell and wheezing at 0.1 mg/m<sup>3</sup>. irritation, eyes and tears at 0.6 mg/m<sup>3</sup>, dyspnea, cough, chest tightness and headache at about 12 mg/m<sup>3</sup> to 24 mg/m<sup>3</sup>; pneumonia, emphysema and even death [2] greater than 60 mg/m<sup>3</sup>.Common aldehydes mainly include formaldehyde, acetaldehyde, acrolein, acetone, acetaldehyde, butenaldehyde, butyraldehyde, benzaldehyde, isopentaldehyde, n-pentaldehyde, adjacent-methyl benzaldehyde, inter-methyl benzaldehyde, p-methyl benzaldehyde, n-hexanaldehyde 2, 5-Dimmethyl benzaldehyde et other 15 [3], Home decoration products are the enrichment of aldehyde gas, currently, Domestic and foreign to coatings, flooring and other products of aldehyde volatile substances research more, However, fewer studies on door products include [4], In order to conduct the quantitative detection of the possible aldehyde volatile substances in the whole door product, The chromatographic detection method established in this paper, The proposed method has a low cost and a high sensitivity, Convenient process.

## **2. Experimental Section**

### **2.1 Instruments and Reagents**

HP6890 C with FID detector; HP-1N0wAx column 30 mx530µmx1.80 m; 50ml (Class A) volumetric bottle; organic filter film with 0.45 m aperture; 350mg / 3mL DNPH column.

## 2.2 Gas Acquisition and Preparation of Standard Solutions

The whole door of the aldehyde volatile gas to be tested is set in the homemade "whole door frame free formaldehyde collection machine", ( $23 \pm 1$ ) °C, relative humidity ( $50 \pm 5$ )%, the surface air flow rate of the test piece is: 0.1m/s~0.3m/s, and the collected aldehyde volatile gas is absorbed into the DNPH column.15 Aldosterone diluted into 5 mg/L with acetonitrile standard solution: 10.01 microsyringe to accurately remove formaldehyde, acetaldehyde, acetin, acetone, acetaldehyde, acetaldehyde, butyraldehyde, acetaldehyde, isoacetaldehyde, n-valaldehyde, o-methyl benzaldehyde, inter-methylbenzaldehyde, p-methyl hexaldehyde, 2,5-dimethyl benzaldehyde, and diluted into 5mg / L standard solution with acetonitrile.

## 2.3 Instrument Analysis Conditions

The inlet temperature is 180°C, diversion ratio 1:1; gas flow rate 4.5ml / min (nitrogen, constant current mode), line speed 33 cm/s; initial temperature 50°C for 2.0 min at 10.0°C / min and again 2.0 min; FID detector, temperature of 250°C.Samsample volume 1.01.

## 2.4 Calibration

Take 510 ml volumetric bottles, Take 10.0,50.0,200.0,500.0 and 1000.01 in 10ml volumetric bottles respectively, Dilute to marking with pure water, The standard series of prepared concentrations of 0.94,4.7,18.8,47.0,94.0mg/L (formaldehyde) and 0.92,4.61,18.4,46.1,92.1 mg / L (formaldehyde), With the peak area of the target compound in the standard solution and the corresponding concentration, Draw the standard curve.Pure water was used for the blank measurement simultaneously.

## 3. Detection and Analysis

### 3.1 Optimization of Ahromatography Conditions

Because the proposed method is sensitive and fast, the column temperature is mainly optimized appropriately.The experiment shows that: because in the collected gas, other aldehydes or ketones organic substances may exist besides formaldehyde, so the constant temperature mode is adopted. Due to the poor separation of these organic substances, the program heating mode is adopted.According to the optimized conditions, with high separation, good peak type and short peak onset time, the resulting chromatogram is shown in Fig.1.

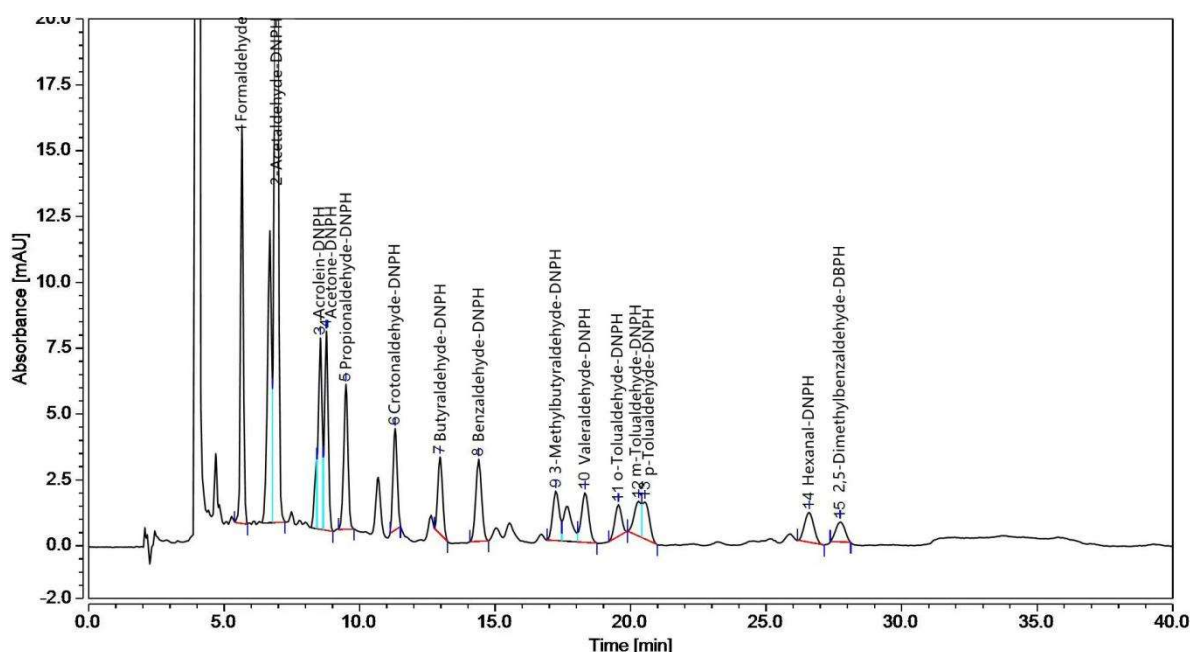


Figure 1. Spiked 0.2mg/kg spectra of 15 aldehyde volatile gases

### 3.2 Detection and Analysis of Various Door Products

In order to exclude the influence of aldehyde gas in air, indoor air was tested first. The chromatogram of indoor air is shown in Figure 2:

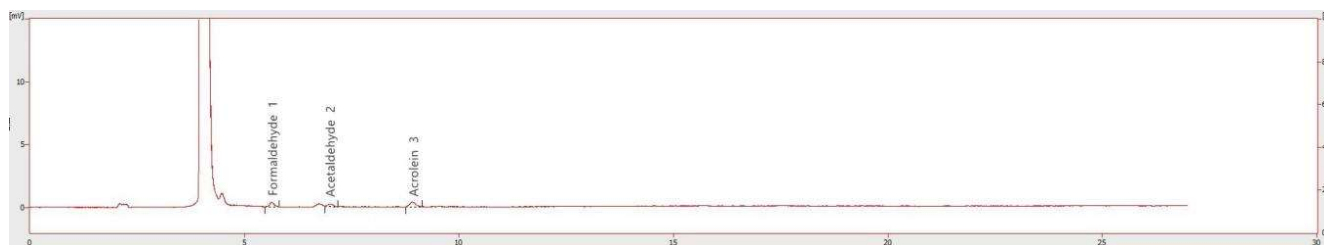


Figure 2. Indoor air blank atlas

The chromatogram of randomly sampled anti-theft doors, fire doors, wooden doors and other products on the market, as shown in Figure 3~5.

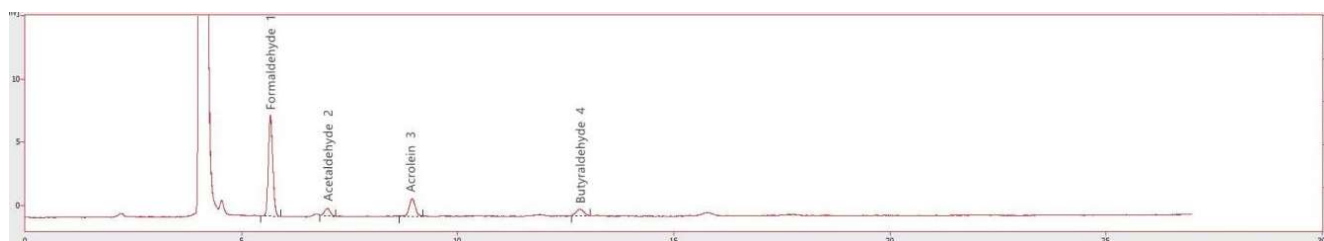


Figure 3. A brand anti-theft door gas collection sample map

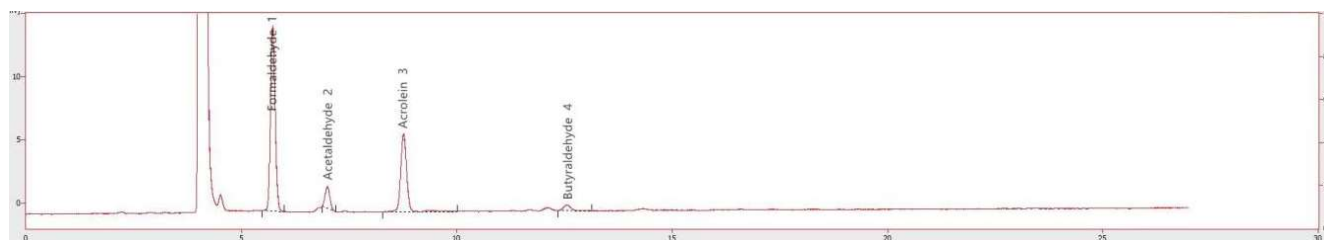


Figure 4. B brand fire door gas collection sample map

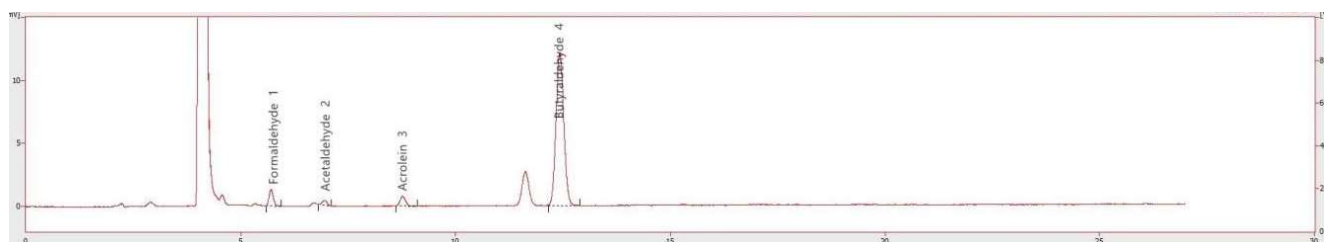


Figure 5. C brand fire door gas collection sample map

Indoor air and the net content of indoor air aldehyde compounds are shown in Table 1:

**Table 1.** Determination results after blank  
unit:  $\mu\text{g}/\text{m}^3$

Classify	RA	A Brand Security Door	B Brand Fire Doors	C Brand Wooden Door
Formaldehyde	53.00	103.18	120.6	9.18
Aldehyde	4.49	14.92	20.98	4.05
Acrolein	16.79	99.38	106.5	9.39
Acetone	-	-	-	-
Propionic Aldehyde	-	-	-	-
Crotonaldehyde	-	-	-	-
Butyraldehyde	15.76	4.97	10.5	373.91
Artificial Almond oil	-	-	-	-
Isovaleraldehyde	-	-	-	-
N-valeral	-	-	-	-
Neighbor-methylbenzaldehyde	-	-	-	-
Inter-Methylbenzaldehyde	-	-	-	-
Right-methylbenzaldehyde	-	-	-	-
Hexanal	-	-	-	-
2,5-Dimethylbenzaldehyde	-	-	-	-

## 4. Conclusion

Chromatography was used to determine the gas content of aldehydes in gate release gas. Research found: 1) from the market randomly selected security doors, fire doors, wooden doors have a certain degree of volatile aldehyde gas; 2) security doors, fire doors, wooden doors three volatile aldehyde gases for formaldehyde, acetaldehyde, acrolein and butyl; 3) fire door formaldehyde content in the highest, this may be the use of more urea aldehyde resin used in the door core plate material. In conclusion, this method is fast, simple and accurate, and can be used for the rapid detection of aldehyde volatile gas in the whole door.

## Acknowledgments

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