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Determination of Volatile Organic Compound Emission from Wood-based Panels



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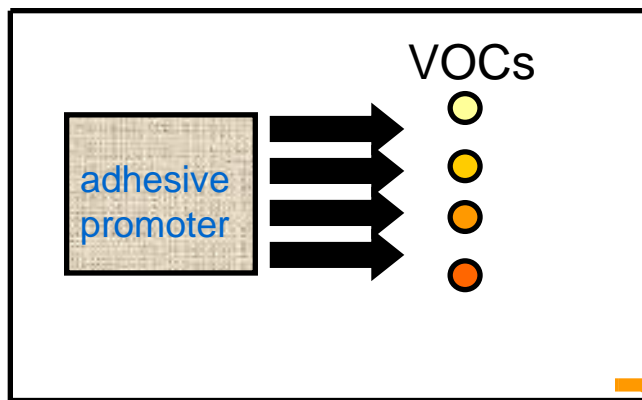
Outline

- *Introduction*
 - *VOC impacts on health and wellbeing*
- *Testing Procedures*
 - *materials and methods*
 - *experiment processing*
- *Result and Conclusion*





1 **reproductive disorders; cancer; nervous system; disorders; asthma and allergies**



VOC

aldehyde and ketone



2 **These diseases maybe have a negative effect on human wellbeing when they exposure to these toxic chemical substance both short-term and long-term.**





Materials

Particleboard is made from wood chips bonded with **urea-formaldehyde resins** under heat and pressure.

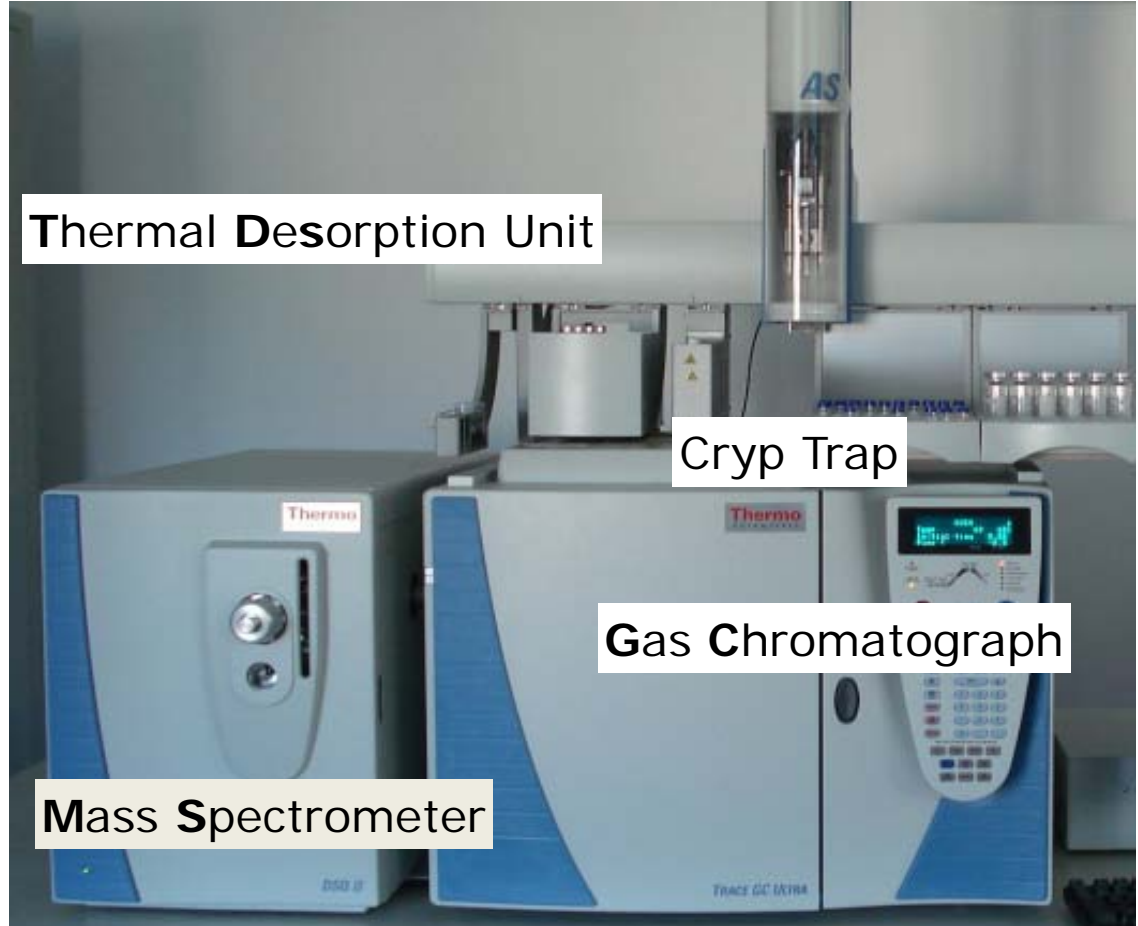
Plywood is made from wood chips and sawdust bonded with **urea-formaldehyde resins and melamine resin** under heat and pressure.

Blockboard is made from poplar and mahogany boned with **urea-formaldehyde resins** under heat and pressure.

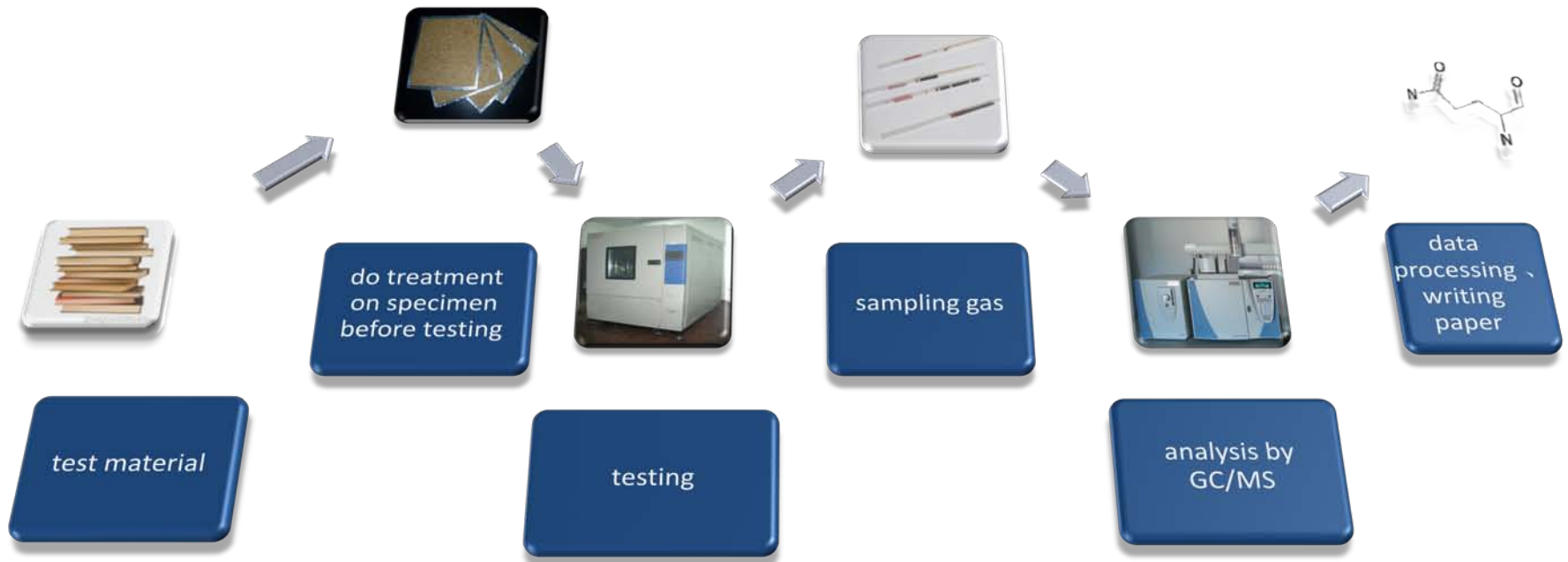
HDF is made from wood chips and sawdust bonded with **urea-formaldehyde resins and melamine resin** under heat and pressure.



Main instrument



Experiment process











Conditions in the chamber

Temperature	$23 \pm 2 \text{ } ^\circ \text{ C}$
Relative air humidity	$50 \pm 5 \text{ \% RH}$
Air velocity	$0,1 \dots 0,3 \text{ m s}^{-1}$
Air exchange rate	1 h^{-1}
Product Loading factor	$1 \text{ m}^2 \text{ m}^{-3}$

The gas was collected on 24th hour, 3rd day, 7th day, 14th day, 21st day and 28th day during the experiment period.



Analysis method

types of VOC	Sampling mode	analytical instrument
aldehydes	Activated carbon adsorbent tube (DNPH) 	HPLC 
all kinds of VOC	Stainless steel tube (non foller) 	GC/MS 
	empty headspace bottle (static headspace analysis) 	GC/MS 
	activated carbon adsorbent(Tenax) 	GC/MS 



Conditions of the thermal desorption system

desorption temperature	280° C
sampling time	10 min
flow	50ml/min
the trapping temperature	-20° C
the heating rate of trapping tube	40° C/sec
transmission line temperature	220° C
split ratio	50





Result and conclusion

the result of VOC emission from wood-based panels

specimen	formaldehyde $\mu\text{g}/\text{m}^3$		aldehydes and ketones (except formaldehyde) $\mu\text{g}/\text{m}^3$		TVOC $\mu\text{g}/\text{m}^3$	
	1	28	1	28	1	28
Particleboard	140.8	98.3	111.1	22.4	100.8	20.8
Plywood	311	117.5	58.6	30.7	19.8	11.8
HDF	1541.3	1099.0	73.7	49.5	351.7	65.1
Blockboard	41.83	20.33	5.45	2.55	2.69	1.54

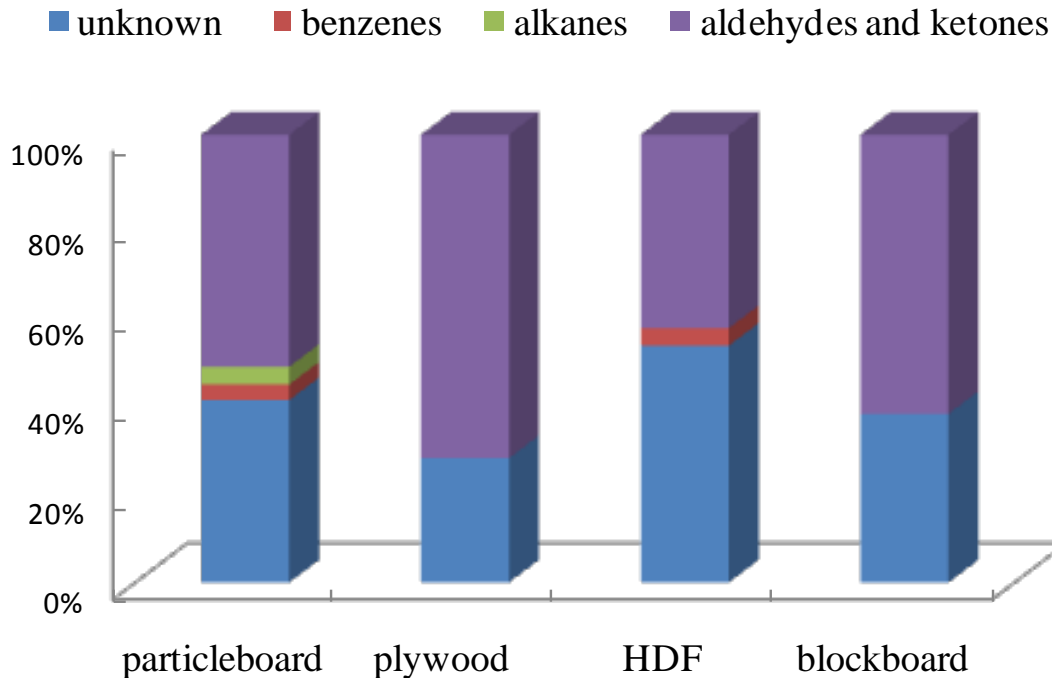
The **formaldehyde** concentration was relatively high, especially **HDF**;

The formaldehyde release amount of the other three boards from high to low was **plywood, particleboard and blockboard, respectively**;





Result and conclusion



Acetaldehyde and acetone were the main **aldehydes and ketones** emission from boards;

There were **alkanes (n-undecane)** and **benzenes** emission from **particleboard**, and only small amount **benzenes** in **HDF**;

No individual VOC in plywood and blockboard.





Conclusion

*Comparing with formaldehyde, the equilibrium concentration of **TVOC** was very **low**, and that of particleboard was higher than plywood.*

*Both formaldehyde and TVOC emission from **blockboard** were the **lowest** one in the four kinds of boards;*





Thank you for your attention!

