



## Building Material Emissions



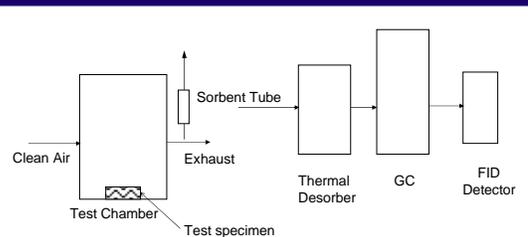
## Material Emissions (off-gassing)

- More than 300 volatile organic compounds (VOCs) identified in indoor air
- Many VOCs are irritants and some are carcinogens
- Indoor VOC concentrations are usually much higher than outdoors
- VOC emissions can be controlled through proper selection of materials

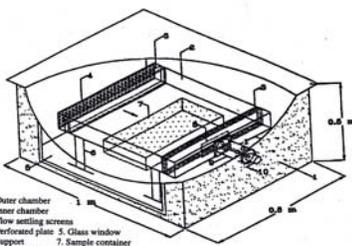
## Source Emission Study: "Wet" Source (Wood Stain)



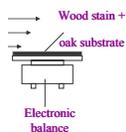
## Emission Study: Small Chamber System



## Wet Source: Small Chamber Study (NRC Canada)

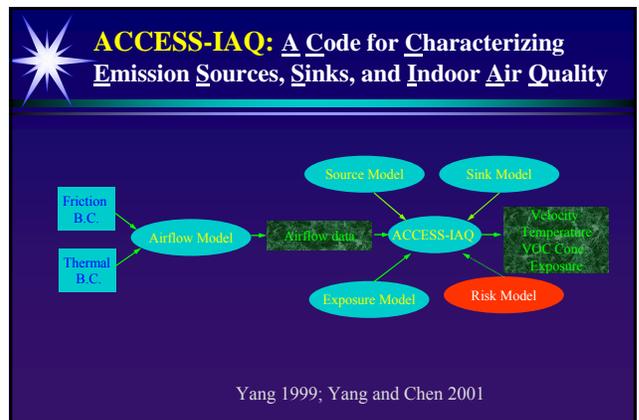
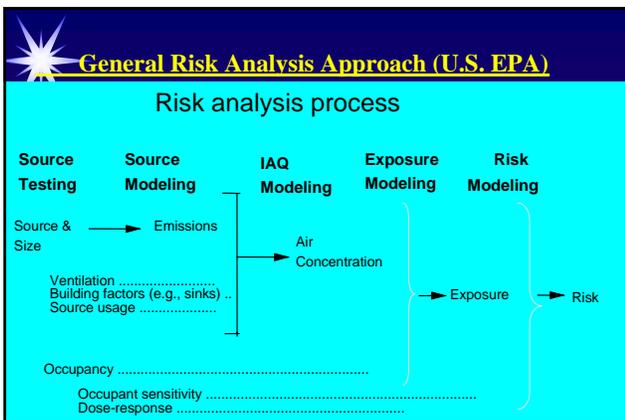
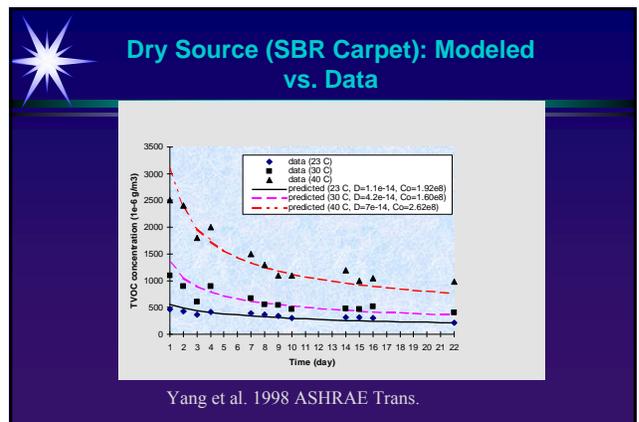
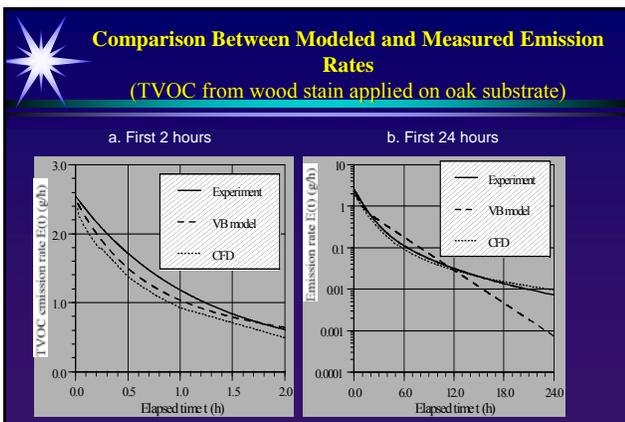
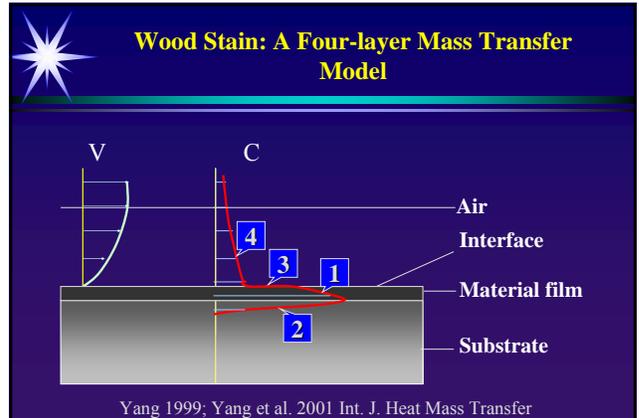
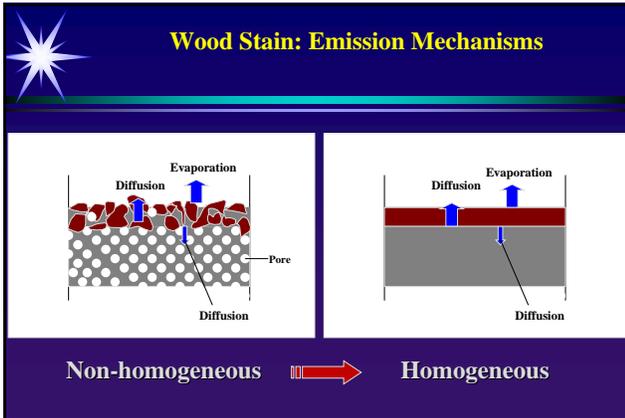


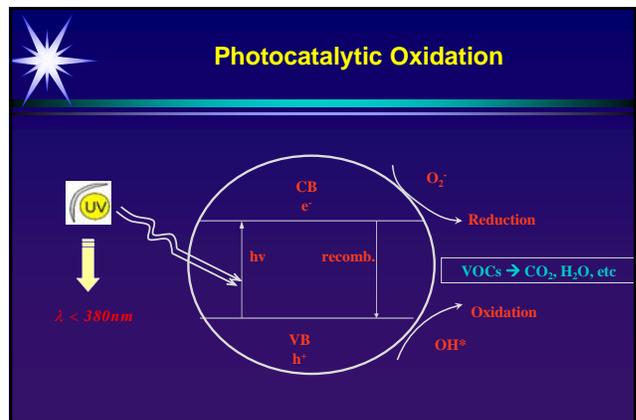
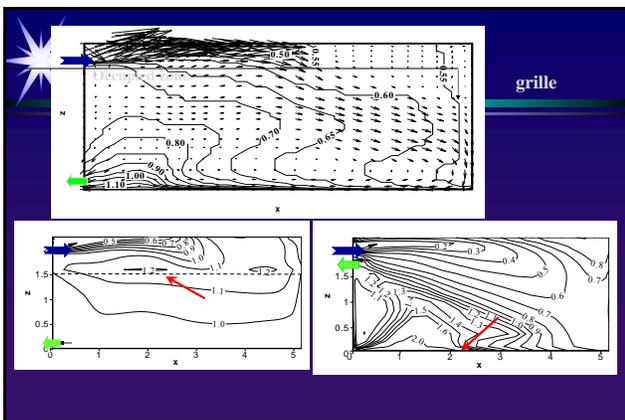
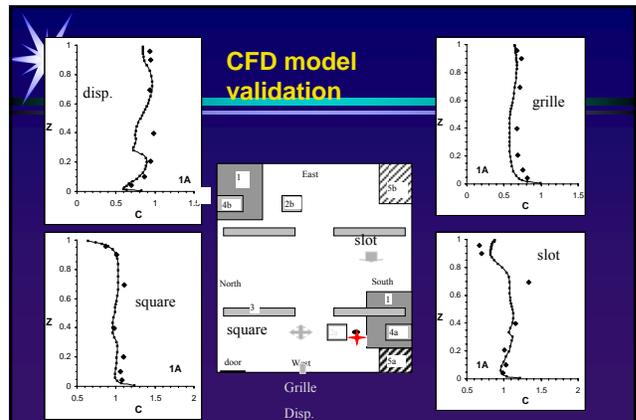
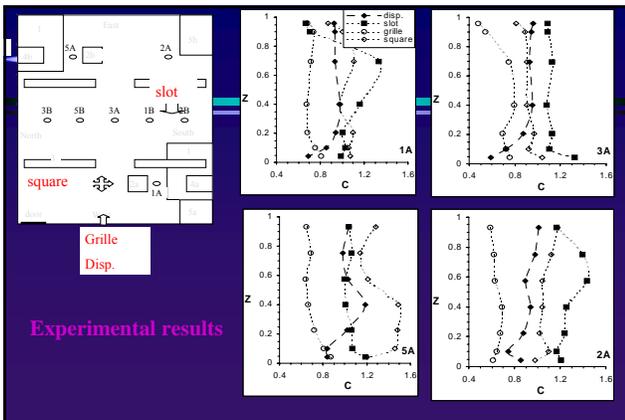
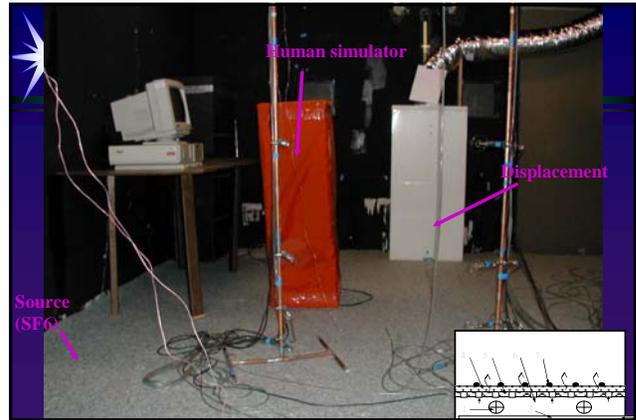
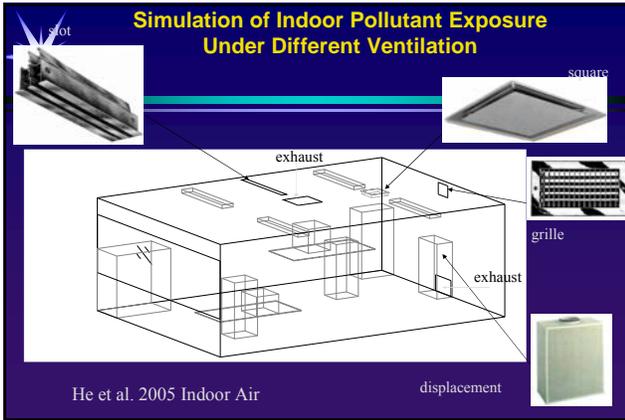
1. Outer chamber
2. Inner chamber
3. Flow settling screens
4. Perforated plate
5. Glass window
6. Support
7. Sample container
8. Buffer plate
9. Fan unit
10. DC motor
11. Discharging holes

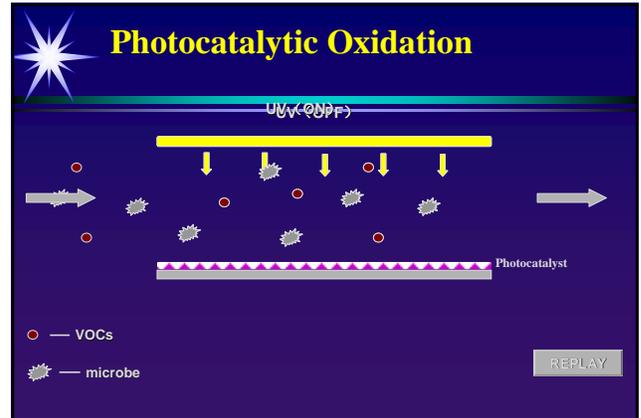
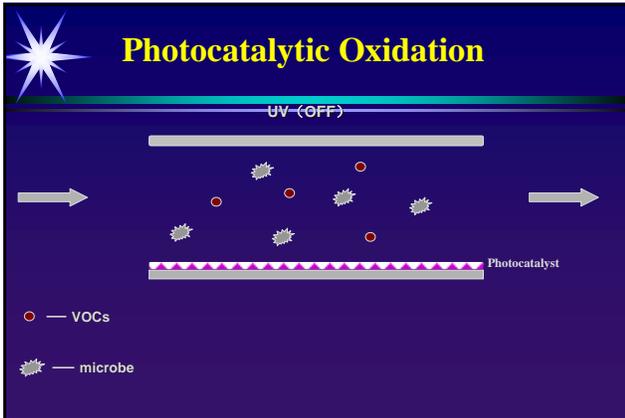


## Wet Source: Small Chamber Study





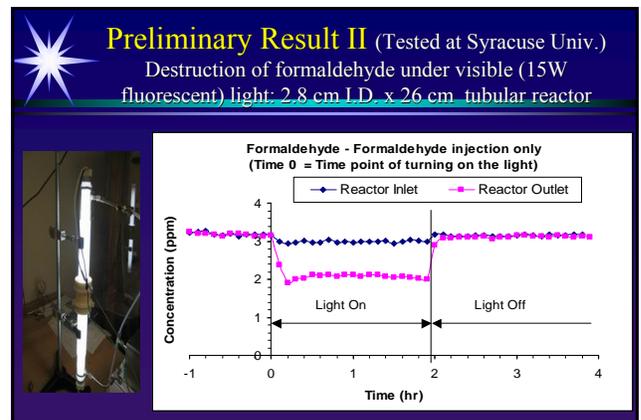
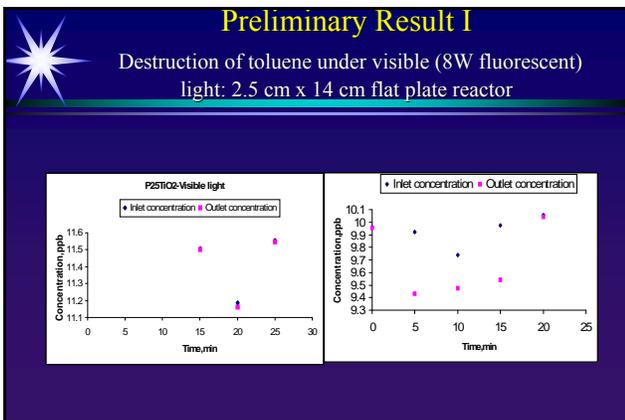
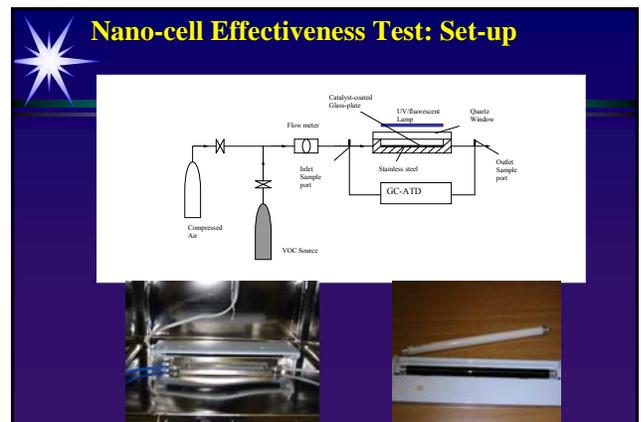




### Development of Nano Photocatalyst

Developing a hybrid photocatalyst (nano-cell) that can decompose air pollutants under **VISIBLE LIGHT**

\* US patent pending



### DNA Damage and Bactericidal Effect by PCO

#### Electrophoresis

Schematic of the electrophoresis process

### Preliminary Results

#### UV illumination

**Figure 2.** Agarose gel electrophotogram of plasmid DNA treated with increasing illumination time: The photocatalyst of lane 1 to lane 6 is hybrid nano-cell; Lanes 7 to 12 is P25. The illumination time of lanes 1 to 6 and lanes 7 to 12 is 0, 5, 10, 20, 40, 60 minutes respectively.

### Preliminary Results

#### Visible light illumination(2hrs)

**Figure 1.** Agarose gel electrophotogram of plasmid DNA treated with increasing concentration of hybrid nano-cell: 0, 0.111, 0.148, 0.222ug/ul for lanes 1-4 respectively.

### Bactericidal Test-Approach

Experimental materials and Conditions

NO.	Photocatalyst	Microorganism	Light intensity (mW/m <sup>2</sup> )	Initial concentration (CFU/ml)
1	P-25	<i>E. coli</i>	1.43	10 <sup>7</sup>
2	P-25	<i>E. coli</i>	1.43	10 <sup>6</sup>
3	Sol-gel	<i>E. coli</i>	1.43	10 <sup>6</sup>
4	Sol-gel	<i>E. coli</i>	1.43	10 <sup>7</sup>
5	Sol-gel	<i>E. coli</i>	1.43	10 <sup>6</sup>
6	Sol-gel	<i>E. coli</i>	1.43	10 <sup>5</sup>
7	Sol-gel	<i>E. coli</i>	1.26	10 <sup>5</sup>
8	Sol-gel	<i>E. coli</i>	0.97	10 <sup>5</sup>
9	Sol-gel	<i>staphylococcus</i>	1.43	10 <sup>6</sup>
10	Sol-gel	<i>Candida albicans</i>	1.43	10 <sup>6</sup>
11	Sol-gel	bacteriophage	1.43	10 <sup>6</sup>

### Bactericidal Test-Results

- The bactericidal effect of PCO is higher than the control tests of only UVA, only TiO<sub>2</sub> and dark;
- A shoulder is presented during the whole photokilling process ;
- The higher killing phase can be fitted using the Chick Model  $\ln(N_t/N_0) = -kt + b_2$  ( $N_t, N_0$  is the *E. coli* colony numbers at time  $t$  and 0, CFU/ml;  $K$  is the photokilling constant, M<sup>-1</sup>min<sup>-1</sup>)

Sol-gel material; Light Intensity=1.43mW/m<sup>2</sup>; Test microbe *E. coli*; Initial cell concentration=10<sup>6</sup>CFU/ml;

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