**Table 1. Information of Materials Used for Small Chamber Tests**

| Materials | Description | Size (L x W x H, cm) | Used for Tests |
|---|---|---|---|
| Gypsum Wallboard | National Gypsum, ½' conventional | 35 X 20 X1.3 | T2, T3, T7, T10, T12 |
| Carpet | Cut pile tufted carpet 100% high UV olefin fiber with nature rubber back for use indoors & outdoors | 35 x 20 x 0.4 | T4, T8, T13 |
| Vinyl Flooring | No wax vinyl flooring, no gloss | 35 x 20 x0.25 | T5, T9 |
| Mortar | Round | Radius 16cm, thickness 1.5cm | T11 |
| Latex Paint | Classic 99 Flat Interior Latex Paint, Dover White | Not Applicable | All gypsum board tests |

**Table 2. Sink Effect Tests Conducted**

| Test ID | VOCs [a] | Materials (number) [b] | Adsorption Duration (hrs) | Desorption Duration (hrs) | Loading ($m^{-1}$) [c] | Average Chamber Inlet %RH±STD | Average Chamber %RH±STD | Average Chamber Temp(ºC)±STD | Average ACH($h^{1}$) | Source Emission Rate (µg/min) | HTC [d] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | EB | Chamber | 48 | 25 | 16.6 | 46.2±1.5 | 44.9±1.3 | 23.4±0.1 | 1.0 | 10.2 | No |
| T2 | EB | GB (8) | 48 | 26 | 12.2 | 42.0±0.8 | 45.9±0.8 | 23.5±0.0 | 1.0 | 9.3 | No |
| T3 | EB | GB (8) | 144 | 49 | 12.2 | 41.6±0.7 | 44.7±0.3 | 23.5±0.0 | 1.0 | 10.0 | Yes |
| T4 | EB | Carpet (1) | 144 | 74 | 1.3 | NA [e] | NA [e] | 23.4±0.1 | 1.0 | 10.0 | Yes |
| T5 | EB | VF (4) | 144 | 388 | 5.4 | 36.2±5.8 | 46.1±5.1 | 23.3±2.0 | 1.0 | 9.4 | Yes |
| T6 | DOD | Chamber | 48 | 79 | 16.6 | 45.0±6.1 | 45.1±6.1 | 23.1±2.0 | 1.0 | 7.8 | No |
| T7 | DOD | GB (8) | 144 | 72 | 12.2 | 40.5±0.7 | 45.7±1.2 | 23.3±0.2 | 1.0 | 7.9 | Yes |
| T8 | DOD | Carpet (1) | 144 | 73 | 1.3 | 43.2±1.4 | 43.6±1.0 | 23.3±0.3 | 1.0 | 7.1 | Yes |
| T9 | DOD | VF (4) | 144 | 2208 | 5.4 | 37.7±1.1 | 43.9±1.6 | 24.1±2.2 | 1.0 | 7.2 | Yes |
| T10 | 1-BUT | GB (8) | 144 | 72 | 12.2 | 41.4±1.5 | 39.9±1.2 | 22.2±0.5 | 1.0 | 10.4 | Yes |
| T11 | DEC | Mortar (1) | 48 | 95 | 1.6 | 43.0±1.1 | 42.6±0.6 | 23.1±0.3 | 1.0 | 8.1 | Yes |
| T12 | DEC | GB (8) | 48 | 97 | 12.2 | 40.7±1.0 | 40.6±0.6 | 23.6±0.0 | 1.0 | 8.6 | Yes |
| T13 | DEC | Carpet (1) | 48 | 71 | 1.3 | 47.0±0.6 | 46.5±0.9 | 23.3±0.4 | 1.0 | 9.0 | Yes |

[a.] EB is ethylbenzene, DOD is dodecane, 1-BUT is 1-butanol, and DEC is decane.

[b.] GB is latex paint painted gypsum wallboard, VF is vinyl flooring. Each piece of test material is 35cm x 20 cm, number is the number of pieces used in each test.

[c.] Loading = Test Specimen Surface Area/ (Chamber Volume – Test Specimen Volume). Or Loading = Empty Chamber Surface/Chamber Volume.

[d.] HTC is the high temperature chamber test performed right after the small chamber test to investigate VOC- surface adsorption or diffusion for the test material

[e.] NA is not available due to chamber DAS problem.

**Table 3. Sink Parameters Estimated from Experimental Data**

| Test ID | VOC | Materials | $k_a$ (m/h) | $k_d$ (/h) | $K_e$ (m) | K[a] | $D_e$ ($m^2/s$)[a] |
|---|---|---|---|---|---|---|---|
| T1 | Ethylbenzene | Stainless Steel Chamber | 0.00 | 0.05 | 0.04 | NA[b] | NA |
| T2 | Ethylbenzene | Gypsum Board | 0.13 | 0.15 | 0.87 | 38 | $9.44 \times 10^{-9}$ |
| T3 | Ethylbenzene | Gypsum Board | 0.14 | 0.15 | 0.93 | 38 | $9.44 \times 10^{-9}$ |
| T4 | Ethylbenzene | Carpet | 1.33 | 1.26 | 1.06 | 660 | $1.00 \times 10^{-14}$ |
| T5 | Ethylbenzene | Vinyl Flooring | 0.08 | 0.02 | 4.00 | NA | NA |
| T6 | Dodecane | Stainless Steel Chamber | 0.01 | 0.03 | 0.23 | NA | NA |
| T7 | Dodecane | Gypsum Board | 0.15 | 0.01 | 15 | 1130 | $8.61 \times 10^{-10}$ |
| T8 | Dodecane | Carpet | 1.74 | 0.08 | 21.75 | 18400 | $1.22 \times 10^{-14}$ |
| T9 | Dodecane | Vinyl Flooring | 0.76 | 0.01 | 76 | 47000 | $1.92 \times 10^{-13}$ |
| T10 | 1-Butanol | Gypsum Board | 0.20 | 0.03 | 6.67 | 720 | $2.17 \times 10^{-09}$ |
| T11 | Decane | Mortar | 8.52 | 61.48 | 0.14 | NA | NA |
| T12 | Decane | Gypsum Board | 0.14 | 0.11 | 1.27 | 130 | $3.61 \times 10^{-09}$ |
| T13 | Decane | Carpet | 0.97 | 0.76 | 1.28 | 2070 | $3.89 \times 10^{-13}$ |
| Geometric mean (exclude empty chamber tests) | | | 0.43 | 0.15 | 2.91 | 826 | $2.60 \times 10^{-11}$ |

[a] from reference [31].

[b] NA is not available.

**Table 4. Mass Balance Summary**

| Test ID | VOCs | Materials (number) | Material Area ($m^2$) | Experimental Data | | | | Langmuir Model Prediction | Diffusion Model Prediction |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $M_{out}$ (mg) | $(C_e-C_{dt})V$ (mg) | $M_{HTC}$ (mg) | $M_\infty$ (mg) | $M_\infty$ (mg) | $M_\infty$ (mg) |
| T1 | EB | Chamber | 0.88 | 0.7 | 0.6 | Not applicable | 0.12 | 0.38 | Not applicable |
| T2 | EB | GB (8) | 0.56 | 3.0 | 0.4 | Not measured | 2.60 | 4.17 | 5.47 |
| T3 | EB | GB (8) | 0.56 | 6.0 | 0.5 | 2.61/5.3 | 8.07/10.8[c] | 5.69 | 6.08 |
| T4 | EB | Carpet (1) | 0.07 | 1.8 | 0.6 | 0.047 | 1.27 | 0.78 | 1.04 |
| T5 | EB | VF(4) | 0.28 | 10.6 | 0.5 | 0.14 | 10.23 | 12.2 | No D data |
| T6 | DOD | Chamber | 0.88 | 0.8 | 0.4 | Not applicable | 0.36 | 1.50 | Not applicable |
| T7 | DOD | GB (8) | 0.56 | 4.7 | 0.2 | 23.1 | 27.7 | 48.6 | 44.3 |
| T8 | DOD | Carpet (1) | 0.07 | 7.5 | 0.3 | 5.9 | 13.1 | 9.79 | 27.7 |
| T9 | DOD | VF (4) | 0.28 | 33.1 | 0.1 | 0.8 | 33.7 | 54.54 | No D data |
| T10 | 1-BUT | GB (8) | 0.56 | 14.1 | 0.3 | 10.5 | 24.4 | 31.41 | 64.4 |
| T11 | DEC | Mortar (1) | 0.08 | 0.8 | 0.5 | 0.03 | 0.36 | 0.10 | No D data |
| T12 | DEC | GB (8) | 0.56 | 7.2 | 0.4 | 0.8 | 7.66 | 5.26 | 10.4 |
| T13 | DEC | Carpet (1) | 0.07 | 1.9 | 0.5 | 0.3 | 1.77 | 0.82 | 0.69 |

[c.] two tests were conducted

**Table 5. Statistic Analysis of Models' Performance Using ASTM D5157-97**

| Test ID | Parameters | No Sink | Langmuir-isotherm model | Diffusion model | Criteria |
|---|---|---|---|---|---|
| T1 | Correlation Coefficient, r | 0.997 | 0.997 | NA [a] | r ≥ 0.9 |
| | Slope, b | 1.023 | 0.989 | NA | 0.75< b <1.25 |
| | Intercept, a [b] | 0.070 | -0.135 | NA | 1.94 [b] |
| | NMSE | 0.003 | 0.002 | NA | ≤ 0.25 |
| | FB | 0.017 | 0.007 | NA | ≤ 0.25 |
| | FS | 0.059 | -0.015 | NA | ≤ 0.5 |
| T2 | Correlation Coefficient, r | 0.764 | 0.988 | 0.977 | r ≥ 0.9 |
| | Slope, b | 1.27 | 0.920 | 0.926 | 0.75< b <1.25 |
| | Intercept, a | 0.632 | -0.755 | -0.622 | 1.45 |
| | NMSE | 0.224 | 0.007 | 0.009 | ≤ 0.25 |
| | FB | 0.147 | 0.049 | 0.032 | ≤ 0.25 |
| | FS | 0.935 | -0.143 | -0.108 | ≤ 0.5 |
| T3 | Correlation Coefficient, r | 0.746 | 0.992 | 0.994 | r ≥ 0.9 |
| | Slope, b | 1.26 | 0.998 | 1.05 | 0.75< b <1.25 |
| | Intercept, a | 0.906 | -0.197 | 0.066 | 1.47 |
| | NMSE | 0.296 | 0.005 | 0.005 | ≤ 0.25 |
| | FB | 0.102 | 0.032 | 0.039 | ≤ 0.25 |
| | FS | 0.964 | 0.013 | 0.111 | ≤ 0.5 |
| T4 | Correlation Coefficient, r | 0.963 | 0.991 | 0.961 | r ≥ 0.9 |
| | Slope, b | 1.09 | 1.03 | 1.07 | 0.75< b <1.25 |
| | Intercept, a | 0.347 | -0.085 | 0.243 | 1.72 |
| | NMSE | 0.039 | 0.009 | 0.038 | ≤ 0.25 |
| | FB | 0.039 | 0.039 | 0.031 | ≤ 0.25 |
| | FS | 0.246 | 0.072 | 0.208 | ≤ 0.5 |
| T5 | Correlation Coefficient, r | 0.958 | 0.974 | NA | r ≥ 0.9 |
| | Slope, b | 1.41 | 0.943 | NA | 0.75< b <1.25 |
| | Intercept, a | 1.52 | -0.522 | NA | 1.48 |
| | NMSE | 0.107 | 0.011 | NA | ≤ 0.25 |
| | FB | 0.138 | 0.031 | NA | ≤ 0.25 |
| | FS | 0.730 | -0.083 | NA | ≤ 0.5 |
| T6 | Correlation Coefficient, r | 0.991 | 0.991 | NA | r ≥ 0.9 |
| | Slope, b | 1.11 | 0.974 | NA | 0.75< b <1.25 |
| | Intercept, a | 0.240 | -0.215 | NA | 1.23 |
| | NMSE | 0.016 | 0.007 | NA | ≤ 0.25 |
| | FB | 0.056 | 0.018 | NA | ≤ 0.25 |
| | FS | 0.221 | -0.035 | NA | ≤ 0.5 |

**Table 5. Statistic Analysis of Models' Performance Using ASTM D5157-97 (Continued)**

| Test ID | Parameters | No Sink | Langmuir-isotherm model | Diffusion model | Criteria |
|---|---|---|---|---|---|
| T7 | Correlation Coefficient, r | 0.885 | 0.942 | 0.156 | r ≥ 0.9 |
| | Slope, b | 2.92 | 0.892 | 0.122 | 0.75< b <1.25 |
| | Intercept, a | 3.25 | -0.333 | -1.86 | 0.764 |
| | NMSE | 0.835 | 0.015 | 0.351 | ≤ 0.25 |
| | FB | 0.601 | 0.001 | -0.312 | ≤ 0.25 |
| | FS | 1.66 | -0.109 | -0.486 | ≤ 0.5 |
| T8 | Correlation Coefficient, r | 0.536 | 0.976 | 0.550 | r ≥ 0.9 |
| | Slope, b | 0.985 | 0.933 | 0.921 | 0.75< b <1.25 |
| | Intercept, a | -1286 | -685 | -1217 | 976 |
| | NMSE | 0.496 | 0.021 | 0.410 | ≤ 0.25 |
| | FB | 0.272 | 0.103 | 0.208 | ≤ 0.25 |
| | FS | 1.09 | -0.089 | 0.949 | ≤ 0.5 |
| T9 | Correlation Coefficient, r | 0.702 | 0.922 | 0.970 | r ≥ 0.9 |
| | Slope, b | 3.18 | 0.753 | 2.00 | 0.75< b <1.25 |
| | Intercept, a | 615 | -482 | 461 | 433 |
| | NMSE | 2.360 | 0.035 | 0.473 | ≤ 0.25 |
| | FB | 0.955 | 0.031 | 0.539 | ≤ 0.25 |
| | FS | 1.81 | -0.400 | 1.24 | ≤ 0.5 |
| T10 | Correlation Coefficient, r | 0.339 | 0.894 | 0.650 | r ≥ 0.9 |
| | Slope, b | 0.919 | 0.686 | 0.591 | 0.75< b <1.25 |
| | Intercept, a | -3513. | -1934 | -614 | 1335 |
| | NMSE | 0.842 | 0.034 | 0.263 | ≤ 0.25 |
| | FB | 0.448 | 0.047 | -0.345 | ≤ 0.25 |
| | FS | 1.52 | -0.517 | -0.190 | ≤ 0.5 |
| T11 | Correlation Coefficient, r | 0.996 | 0.999 | NA | r ≥ 0.9 |
| | Slope, b | 1.02 | 1.00 | NA | 0.75< b <1.25 |
| | Intercept, a | 0.210 | 0.112 | NA | 1.16 |
| | NMSE | 0.006 | 0.002 | NA | ≤ 0.25 |
| | FB | -0.021 | -0.020 | NA | ≤ 0.25 |
| | FS | 0.056 | 0.010 | NA | ≤ 0.5 |
| T12 | Correlation Coefficient, r | 0.734 | 0.982 | 0.949 | r ≥ 0.9 |
| | Slope, b | 1.46 | 0.949 | 0.747 | 0.75< b <1.25 |
| | Intercept, a | 0.890 | -0.338 | -0.491 | 1.06 |
| | NMSE | 0.437 | 0.009 | 0.056 | ≤ 0.25 |
| | FB | 0.220 | 0.028 | -0.147 | ≤ 0.25 |
| | FS | 1.19 | -0.070 | -0.470 | ≤ 0.5 |

**Table 5. Statistic Analysis of Models' Performance Using ASTM D5157-97 (Continued)**

| Test ID | Parameters | No Sink | Langmuir-isotherm model | Diffusion model | Criteria |
|---|---|---|---|---|---|
| T13 | Correlation Coefficient, r | 0.962 | 0.998 | 0.960 | r ≥ 0.9 |
| | Slope, b | 1.16 | 1.01 | 1.09 | 0.75< b <1.25 |
| | Intercept, a | 0.705 | 0.085 | 0.575 | 1.38 |
| | NMSE | 0.048 | 0.001 | 0.040 | ≤ 0.25 |
| | FB | 0.031 | -0.003 | -0.011 | ≤ 0.25 |
| | FS | 0.367 | 0.028 | 0.257 | ≤ 0.5 |

a. NA is not applicable.
b. The criteria of the intercept, a, is ≤ 25% of average measured concentration