

**Supplementary information (SI)**

**Table S1.** Relative standard deviations (%RSDs, n=5) for benzene measured in the exposure chamber at three concentrations, after 4 h or 8 h exposure times.

|              | 9.8 µg m <sup>-3</sup> | 99.6 µg m <sup>-3</sup> | 1004 µg m <sup>-3</sup> |
|--------------|------------------------|-------------------------|-------------------------|
| Perkin Elmer |                        |                         |                         |
| 4h           | 16                     | 15                      | 8.8                     |
| 8h           | 13                     | 15                      | 4.0                     |
| SKC-Ultra    |                        |                         |                         |
| 4h           | 15                     | 16                      | 19                      |
| 8h           | 2.7                    | 7.5                     | 16                      |
| Radiello     |                        |                         |                         |
| 4h           | 12                     | 19                      | 11                      |
| 8h           | 8.8                    | 18                      | 6.4                     |

**Table S2.** Relative standard deviations (%RSDs, n=5) for 1,3-butadiene measured in the exposure chamber at three concentrations, after 4 h or 8 h exposure times.

|              | 11.8 µg m <sup>-3</sup> | 104.1 µg m <sup>-3</sup> | 1016 µg m <sup>-3</sup> |
|--------------|-------------------------|--------------------------|-------------------------|
| Perkin Elmer |                         |                          |                         |
| 4h           | 9.4                     | 12                       | 17                      |
| 8h           | 8.9                     | 13                       | 7.4                     |
| SKC-Ultra    |                         |                          |                         |
| 4h           | 9.5                     | 13                       | 15                      |
| 8h           | 6.1                     | 15                       | 11                      |
| Radiello     |                         |                          |                         |
| 4h           | 12                      | 17                       | 7.7                     |
| 8h           | 14                      | 8.5                      | 8.9                     |

**Table S3.** Average concentrations at four sampling sites at the refinery of 1,3-butadiene and benzene ( $\mu\text{g m}^{-3}$ ) determined by active sampling (NPL-pump) and passive samplers from three different manufacturers using the sampler rates according to Table 2.

| Sampling sites | 1,3-<br>butadiene |     | benzene |     |
|----------------|-------------------|-----|---------|-----|
|                | 4 h               | 8 h | 4 h     | 8 h |
| <b>F1</b>      |                   |     |         |     |
| NPL-pump       | 1.1               | 3.9 | 2.7     | 3.7 |
| Perkin Elmer   | 1.1               | 5.2 | 3.5     | 3.2 |
| SKC-Ultra      | 1.1               | 3.2 | 3.0     | 2.7 |
| Radiello       | 1.0               | 2.5 | 3.0     | 2.8 |
| <b>F2</b>      |                   |     |         |     |
| NPL-pump       | 1.3               | 2.7 | 1.1     | 1.4 |
| Perkin Elmer   | 1.8               | 3.3 | 1.8     | 2.2 |
| SKC-Ultra      | 1.7               | 3.0 | 1.2     | 1.9 |
| Radiello       | 1.5               | 2.4 | 1.0     | 1.3 |
| <b>F3</b>      |                   |     |         |     |
| NPL-pump       | 13                | 14  | 36      | 37  |
| Perkin Elmer   | 19                | 19  | 31      | 34  |
| SKC-Ultra      | 6.0               | 4.8 | 31      | 45  |
| Radiello       | 6.2               | 2.6 | 46      | 43  |
| <b>F4</b>      |                   |     |         |     |
| NPL-pump       | 50                | 33  | 260     | 200 |
| Perkin Elmer   | 63                | 35  | 350     | 200 |
| SKC-Ultra      | 28                | 16  | 210     | 130 |
| Radiello       | 13                | 5.3 | 290     | 190 |