Semivolatile organic compounds are ubiquitous in indoor environments, redistributing from their original sources to all indoor surfaces. Exposures resulting from their indoor presence contribute to detectable body burdens of diverse SVOCs, including pesticides, plasticizers, and flame retardants. This paper critically examines equilibrium partitioning of SVOCs among indoor compartments. It proceeds to evaluate kinetic constraints on sorptive partitioning to organic matter on fixed surfaces and airborne particles. Analyses indicate that equilibrium partitioning is achieved faster for particles than for typical indoor surfaces; indeed, for a strongly sorbing SVOC and a thick sorptive reservoir, equilibrium partitioning is never achieved. Mass-balance considerations are used to develop physical-science-based models that connect source- and sink-rates to airborne concentrations for commonly encountered situations, such as the application of a pesticide or the emission of a plasticizer or flame retardant from its host material. Calculations suggest that many SVOCs have long indoor persistence, even after the primary source is removed. If the only removal mechanism is ventilation, moderately sorbing compounds (K-oa > 10(10)) may persist indoors for hundreds to thousands of hours, while strongly sorbing compounds (K-oa > 10(12)) may persist for years. The paper concludes by applying the newly developed framework to explore exposure pathways of building occupants to indoor SVOCs. Accumulation of SVOCs as a consequence of direct air-to-human transport is shown to be potentially large, with a maximum indoor-air processing rate of 10-20 m(3)/h for SVOC uptake by human skin, hair and clothing. Levels on human skin calculated with a simple model of direct air-to-skin transfer agree remarkably well with levels measured in dermal hand wipes for SVOCs possessing a wide range of octanol-air partition coefficients.

General information
State: Published
Organisations: Section for Indoor Environment, Department of Civil Engineering
Authors: Weschler, C. J. (Intern), Nazaroff, W. (Ekstern)
Pages: 9018-9040
Publication date: 2008
Main Research Area: Technical/natural sciences

Publication information
Journal: Atmospheric Environment
Volume: 42
Issue number: 40
ISSN (Print): 1352-2310
Ratings:
    BFI (2018): BFI-level 1
    Web of Science (2018): Indexed yes
    BFI (2017): BFI-level 1
    Scopus rating (2017): CiteScore 4.12 SJR 1.523 SNIP 1.451
    Web of Science (2017): Indexed Yes
    BFI (2016): BFI-level 1
    Scopus rating (2016): CiteScore 4.01 SJR 1.495 SNIP 1.599
    Web of Science (2016): Indexed yes
    BFI (2015): BFI-level 1
    Scopus rating (2015): SJR 1.754 SNIP 1.615 CiteScore 3.73
    Web of Science (2015): Indexed yes
    BFI (2014): BFI-level 1
    Scopus rating (2014): SJR 1.612 SNIP 1.661 CiteScore 3.55
    Web of Science (2014): Indexed yes
    BFI (2013): BFI-level 1
    Scopus rating (2013): SJR 1.766 SNIP 1.62 CiteScore 3.52
    ISI indexed (2013): ISI indexed yes
    Web of Science (2013): Indexed yes
    BFI (2012): BFI-level 1
    Scopus rating (2012): SJR 1.981 SNIP 1.674 CiteScore 3.47
    ISI indexed (2012): ISI indexed yes
    Web of Science (2012): Indexed yes
    BFI (2011): BFI-level 1
    Scopus rating (2011): SJR 1.971 SNIP 1.78 CiteScore 3.84
    ISI indexed (2011): ISI indexed yes