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Migration of contaminated soil and airborne particulates to indoor dust

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Abstract

We have developed a modeling and measurement framework for assessing transport of contaminated soils and airborne particulates into a residence, their subsequent distribution indoors via resuspension and deposition processes, and removal by cleaning and building exhalation of suspended particles. The model explicitly accounts for the formation of house dust as a mixture of organic matter (OM) such as shed skin cells and organic fibers, soil tracked-in on footwear, and particulate matter (PM) derived from the infiltration of outdoor air. We derived formulas for use with measurements of inorganic contaminants, crustal tracers, OM, and PM to quantify selected transport parameters. Application of the model to residences in the U.S. Midwest indicates that As in ambient air can account for nearly 60% of the As input to floor dust, with soil track-in representing the remainder. Historic data on Pb contamination in Sacramento, CA, were used to reconstruct sources of Pb in indoor dust, showing that airborne Pb was likely the dominant source in the early 1980s. However, as airborne Pb levels declined due to the phase-out of leaded gasoline, soil resuspension and track-in eventually became the primary sources of Pb in house dust.

Figures

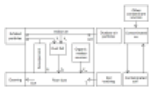

FIGURE 1 Conceptual diagram depicting the movement...

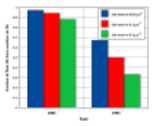

FIGURE 2 Reconstruction of the contributions of...

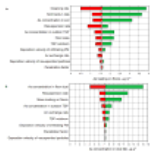

FIGURE 3 Sensitivity analysis of the parameters...

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