

Fate and Transport of PFAS in Indoor and Outdoor Air

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Background/Objectives. Research studies, as well as preliminary assessments and site investigations (PA/SI) in recent years have provided important data for determining the extent of per- and polyfluoroalkyl substances (PFAS) contamination in the environment; but have largely overlooked transport in indoor and outdoor air. PFAS are a group of hundreds if not thousands of different chemicals that have been widely used for their unique physical and chemical properties. Several studies have demonstrated PFAS in air or emission samples, but little is understood about the mode of transport and if PFAS in the subsurface poses a vapor intrusion concern. There is currently some disagreement in literature as to the Henry's constant and vapor pressure of PFOS and PFOA, as a result in some cases it meets the EPA criteria. Additionally, precursors such as fluorotelomer alcohol (FTOHs) and perfluoroalkane sulfonamides (FASAs), have been detected in indoor and outdoor air, but because of the ubiquitous nature of these compounds, their sources may be difficult to define. In addition, it is unknown how far these precursors can travel, and whether their degradation products will sorb to particulate matter or possess an affinity to remain in vapor form. Physical properties of semi-volatile organic compounds in general lead to their binding to atmospheric particulates and to their long distance atmospheric transport – for example certain values of octanol water and air water partition coefficients and low photolytic or oxidative degradability. Similarly, the characteristics that predict local or regional washout or dry deposition of atmospheric semi volatiles are also well known. From these known principles we can comment on, PFOA and PFOS species are most likely to be globally ubiquitous at low concentrations in the atmosphere and likely have localized atmospheric transport near specific sites. Chemical property information suggests that indoor air quality may be impacted under natural and remedial conditions near impacted sites, potentially posing an inhalation risk. However, these compounds are found in many household products, which makes separating consumer product sources from site contaminants a difficult, but necessary step of the evaluation process. It is important to fully understand the sources and fate and transport of these chemicals to properly assess, remediate, and minimize risk to human and ecological health.

Approach/Activities. To evaluate fate and transport of PFAS in indoor and outdoor air, a review of current internal and external research will be performed. Indoor air, outdoor air, and emission data from various sources and studies will be utilized. Carbon chain length, precursor family, sampling method, and sample analysis will be considered during data evaluation.

Results/Lessons Learned. This review will establish our current state of knowledge on fate and transport of PFAS in indoor and outdoor air. Armed with this information we can work towards developing best practices for sampling and analysis. The review may identify knowledge gaps to be filled as part of developing these best practices.