

Atmospheric sources and transport of emerging metal contaminants

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The industrial production of indium is increasing dramatically due to new uses in the rapidly growing electronics, photovoltaic, and LED industries. Despite this increased use, the environmental behavior and toxicity of indium is poorly understood. However, there is some indication that humans are already having a significant impact on its natural cycling.

Indium is released to the atmosphere from high temperature processes such as metal smelting (where it is a byproduct of zinc, lead, and other primary sulfide ores) and coal combustion. It is concentrated in particles smaller than 2.5 μm , meaning that it may be transported long distances and that humans may take up indium via these respirable particles. Analysis of indium in particulate matter from 5 different locations in the northeastern United States near Boston, MA and Rochester, NY over the course of a year suggest that coal combustion may be a steady input of indium to this region, and that smelters north of this region supply particles with significantly elevated indium concentrations. An historical record of indium deposition to a bog in Massachusetts also indicates that coal combustion and smelting have influenced indium's atmospheric concentrations and deposition over time; indium fluxes to the bog have been increasing since the late 1800s, peaking in the early 1970s. This record is counter to the industrial use of indium, but generally tracks patterns of smelting and coal combustion prior to the 1970s. The decrease post 1970s is thought to result from reductions in particulate emissions from stationary sources due to the implementation of the Clean Air Act.