

Industrial influence on indium deposition from the atmosphere to a bog in the northeastern U.S.

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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. Little is known, however, about the natural or industrial cycling of indium or its environmental behavior, despite the fact that industrial emissions to the environment appear to already exceed natural sources.

The history of metal deposition from the atmosphere is often reflected in the vertical profiles of the metals in ombrotrophic bogs, which by definition do not receive surface or subsurface runoff. Analysis of a peat core obtained using a novel freeze corer at Thoreau's Bog in Concord, MA shows that the rate of indium deposition to the bog increased beginning in the early 1900s, peaked in the early 1970s, and then decreased dramatically to pre-1900 values by the present time. This profile is counter to the pattern of indium's industrial use, which has increased only in the past 30-40 years. The profile coincides well, however, with the estimated history of particulate emissions from smelting and from coal combustion in North America. Back-trajectory analysis suggests that smelting was the dominant source of atmospheric particles with high indium concentrations deposited to the bog.

This study suggests that humans have had a significant impact on the environmental cycling of indium, primarily because of releases from metal smelting and coal burning. While releases from the semiconductor and electronics industries are comparatively small at present, this scenario may change with the rapid growth of indium use in these industries.