

A NEW TECHNOLOGY FOR THE TREATMENT OF MERCURY CONTAMINATED WATER AND SOILS

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ABSTRACT

A new technology has been developed for the treatment of contaminated water and soils with lignin derivatives. This has been demonstrated that this technology can be used in the process of removal of high levels of mercury from water, and in the immobilization of leachable mercury in contaminated soils. Lignin derivatives contain an abundance of oxygen-containing functional groups such as phenolic, carboxyl, sulfonyl, alcoholic and enolic structures which will form lignin-metal macromolecular complexes with high stability through ionic and coordinate covalent bonding. This feature is the basis for the application of lignin derivatives in the removal of metal contaminants from water and in the immobilization of leachable metal in soils or sediments. Tests have confirmed that lignin derivatives are capable of combining with a variety of metal ions including chromium, copper, lead, zinc, mercury, nickel and aluminum. In the new water treatment process, lignin derivatives are dissolved in mercury contaminated water to complex mercury in an exceptionally stable form of a lignin-mercury colloid. The lignin-mercury colloid is then coagulated through the addition of a flocculating agent such as ferric chloride. Under optimized conditions, a clean effluent is produced with a residual mercury level of less than $1\mu\text{g l}^{-1}$, together with a ferric sludge that is not leachable by TCLP, EPA Method 1311. In the new soil stabilization process, a new solid adsorbent of ferric-lignin is blended with mercury contaminated soil. This solid adsorbent can stabilize the soil by complexing with mercury and, thereby, greatly reduce the TCLP mercury of soil.

Key words: Lignin derivatives, immobilization, heavy metals, mercury, contaminated water, contaminated soil.

Published in:

ENVIRONMENTAL TECHNOLOGY

Vol.24, 2003, pp. 897-902.