ENVIRONMENTAL RELEASE OF MERCURY FROM COMPACT FLUORESCENT LIGHT BULBS

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Abstract: Compact fluorescent light bulbs (CFLs) are widely used in houses and offices and are gradually substituting the traditional incandescent bulbs. Although CFLs can reduce approximately 75% of energy usage and increase the lifetime by several times as compared to the traditional light bulbs, they contain elemental mercury (Hg) which is toxic to human beings, especially children. Once the CFLs are disposed in the environment and broken, the Hg will release and become a potential threat to human health and the environment. The objective of this study was to determine the releases of Hg from different CFLs under various environmental conditions when CFLs are broken. The U.S. EPA standard method Toxicity Characteristic Leaching Procedure (TCLP) was used to examine the amounts of Hg that can leach out from CFLs under landfill conditions. The U.S. EPA Synthetic Precipitation Leaching Procedure (SPLP) was employed to evaluate the leaching of Hg from CFLs when subjected to rainwater. A specially designed emission chamber was used to measure the Hg emission from broken CFLs in gaseous form; a sorbent tube was used to trap the vapor Hg in the emission for the determination of the amounts of Hg released. In addition, the total Hg contained in the CFLs was measured according to U.S. EPA standard SW-846 Method 7471B. The results show that CFLs contain an average of 2-10 mg Hg, of which about 5% can leach out in the TCLP test and 1% the SPLP test. Some CFLs resulted in TCLP extracts with Hg concentrations higher than the regulatory level of 0.2 mg/L and thus fall into the hazardous waste category. The emission test showed that about 15% of the total Hg in the CFLs can release into the air when broken. It is recommended that used CFLs be collected and handled properly and recycled wherever possible in order to avoid negative environmental impacts and health risk to human beings.

Keywords: Compact Fluorescent Light Bulbs, Mercury, Environmental Release

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