

Polychlorinated biphenyl sources, emissions, and environmental levels in school buildings

Kent Thomas, Zhishi Guo, Xiaoyu Liu, Donald Whitaker

Building materials and components containing polychlorinated biphenyls (PCBs) were used in some U.S. school buildings until the late 1970s and may be present today. PCB emission rates from caulk and fluorescent light ballasts were measured in laboratory chambers. PCB concentrations in building material samples from several schools provided information for characterizing sources and assessing source-environment relationships. Using chamber-derived emission parameters, total PCB emission rates for caulks with >50,000 ppm PCBs in several school locations were estimated to range from 53 to 3100 $\mu\text{g}/\text{h}$ with the sum of congeners PCB44,52,70,84,87,95,101,110,118 contributing >50% of the estimated emissions. Caulk with total PCB concentrations >100,000 ppm at one school showed a congener pattern most consistent with Aroclor 1254 but with depletion of more volatile congeners. The mean total PCB indoor air concentration at that school was 500 ng/m^3 , with the sum of congeners PCB44,49,52,70,87,95,99,101,110,118 contributing 60% of the total. Congener patterns in surface wipes, indoor dust, and building materials were similar to the PCB-containing caulk; soil had more higher-chlorinated congeners. Total PCB emission rates estimated for four intact light ballasts tested in a chamber at 45°C ranged from 0.42 to 33 $\mu\text{g}/\text{h}$, with the sum of trichlorobiphenyls in Aroclor 1242 contributing >70% of the total. Over 90% of 411 building material samples from schools with caulk and light ballast PCB sources had measurable PCBs (median=16 ppm total PCBs) showing secondary source creation. Source materials can release PCBs into school environments resulting in the potential for occupant exposures through multiple routes.