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Sustainable management of hazardous asbestos-containing materials: Containment, stabilization and inertization

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ABSTRACT

Asbestos is a group of six major silicate minerals that belong to the serpentine and amphibole families, and include chrysotile, amosite, crocidolite, anthophyllite, tremolite and actinolite. Weathering and human disturbance of asbestos-containing materials (ACMs) can lead to the emission of asbestos dust, and the inhalation of respirable asbestos fibrous dust can lead to 'mesothelioma' cancer and other diseases, including the progressive lung disease called 'asbestosis'. There is a considerable legacy of in-situ ACMs in the built environment, and it is not practically or economically possible to safely remove ACMs from the built environment. The aim of the review is to examine the three approaches used for the sustainable management of hazardous ACMs in the built environment: containment, stabilization, and inertization or destruction. Most of the asbestos remaining in the built environment can be contained in a physically secured form so that it does not present a significant health risk of emitting toxic airborne fibres. In settings where safe removal is not practically feasible, stabilization and encapsulation can provide a promising solution, especially in areas where ACMs are exposed to weathering or disturbance. Complete destruction and inertization of asbestos can be achieved by thermal decomposition using plasma and microwave radiation. Bioremediation and chemical treatment (e.g., ultrasound with oxalic acid) have been found to be effective in the inertization of ACMs. Technologies that achieve complete destruction of ACMs are found to be attractive because the treated products can be recycled or safely disposed of in landfills.

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