Heavy Metal

1-Heavy Metal Exposure and Cardiovascular Disease

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Abstract

Heavy metals are harmful environmental pollutants that have attracted widespread attention due to their health hazards to human cardiovascular disease. Heavy metals, including lead, cadmium, mercury, arsenic, and chromium, are found in various sources such as air, water, soil, food, and industrial products. Recent research strongly suggests a connection between cardiovascular disease and exposure to toxic heavy metals. Epidemiological, basic, and clinical studies have revealed that heavy metals can promote the production of reactive oxygen species, which can then exacerbate reactive oxygen species generation and induce inflammation, resulting in endothelial dysfunction, lipid metabolism distribution, disruption of ion homeostasis, and epigenetic changes. Over time, heavy metal exposure eventually results in an increased risk of hypertension, arrhythmia, and atherosclerosis. Strengthening public health prevention and the application of chelation or antioxidants, such as vitamins and beta-carotene, along with minerals, such as selenium and zinc, can diminish the burden of cardiovascular disease attributable to metal exposure.

Keywords

Author Keywords

arrhythmiacardiovascular diseaseschelation therapymetals, heavymodels, theoretical

Keywords Plus

LEAD-INDUCED HYPERTENSIONINDUCED OXIDATIVE STRESSNITRIC-OXIDECADMIUM EXPOSUREENDOTHELIAL-CELLSMYOCARDIAL-INFARCTIONLIPID-PEROXIDATIONARSENIC EXPOSUREMERCURY EXPOSUREDNA METHYLATION

Heavy Metal

2-Corrosion effect of acid/alkali on cementitious red mud-fly ash materials containing heavy metal residues

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Abstract

High-strength cementitious red mud-fly ash materials (RFMs) were formed from sodium hydroxide and water glass mixed solutions, and their abilities to solidify heavy metal ions (HMs, e. g., copper and cadmium) were assessed. The mechanism for precipitation of the HMs by corrosive acid/alkali solutions was explored via toxicity leaching tests, as well as SEM, XRD, FT-IR and XPS. The results showed that when the added alkaline activator was not fully consumed, the presence of small amounts of HMs consumed the excess alkaline ions to form hydroxide precipitates that filled the pores of the RFM, so the compressive strength of the RFM increased. Otherwise, the presence of excess HMs reduced the compactness of the RFM and eventually resulted in a highly porous structure, leading to weakening of the material. Additionally, small amounts of anhydrite phases were produced in the RFM. In neutral and alkaline environments, the HMs formed precipitates or coordination complexes with hydroxyl groups, and the solidification efficiencies exceeded 99%. In acidic environments, the HMs converted from their original precipitated forms or ion-hydroxide complexes to free cations. As a result, the HMs were more likely to be separated from the RFMs. Moreover, the RFMs were more prone to disaggregation under acidic conditions, which led to destruction of the RFM microstructure and rerelease of the HMs fixed in the microstructure.

Keywords

Author Keywords
Red mudHeavy metalCementitious materialToxicity leachingSolidification mechanism

Keywords Plus
GEOPOLYMERSIMMOBILIZATIONSTRENGTHMICROSTRUCTUREADSORPTIONCOPPERCD2+XPS