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Preparation of chemical waste germanium concentrates for disposal

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Abstract

The composition of waste from chemical processing of germanium concentrates (WCGC) is characterized by the presence of germanium compounds insoluble in acids, as well as significant amounts of toxic impurities. The main phase components are calcium sulfate dihydrate and four-water calcium hypochlorite. Thermographic research on heating samples of WCGC at 200 °C in the air found that their heat treatment is accompanied by two endothermic effects corresponding to two successive stages of dehydration at exposure from the beginning of heat treatment to 30 minutes with the removal of free moisture and from 30 to 90 minutes with the removal of 1.5 water molecules from gypsum and 4 water molecules – from calcium hypochlorite.

X-ray phase analysis revealed that the heat-treated samples form calcium sulfate hemihydrate and dehydrated calcium hypochlorite. The presence of these compounds gives a strengthening effect when moistened due to the re-formation of crystallohydpates.

In laboratory conditions, options for pelletizing pre-crushed mixtures of heat-treated WCGC and coke using pelletizing and briquetting methods have been tested. The humidity, density, bulk weight and strength of pellets and briquettes for compression and impact were determined immediately after pelletizing, seven-hour exposure and drying at 105 °C. The research results confirm the possibility of obtaining a material suitable for effective utilization of waste from chemical processing of germanium concentrates.

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