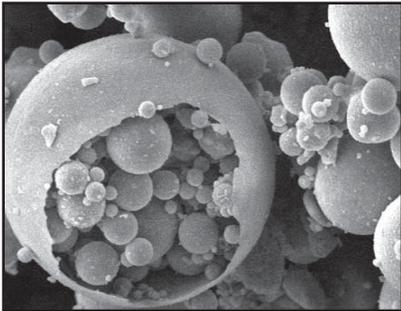


Coal Combustion Products



An SEM image of coal fly ash.

Introduction

Coal combustion products or CCPs are the materials that remain after burning coal to generate electricity. There are a number of different CCPs, but the most important are fly ash, bottom ash and flue gas desulfurization (FGD) materials. Fly ash and bottom ash are primarily composed of valuable industrial minerals such as alumina, silica, lime and iron oxide. FGD is primarily composed of gypsum, the mineral used to make wallboard. CCPs can be used as a replacement for natural materials in construction, providing a quality product while reducing costs. However, of the approximately 125 million tons of CCPs produced each year, more than half goes into landfills. The goal of the IRC is to increase the appropriate use of CCPs in construction, saving money and valuable landfill space.

Applications

Fly ash makes up the largest component of CCPs, with more than 70 million tons produced each year. Fly ash is composed of very fine spherical particles that were removed from the hot emission gases leaving the furnace where the coal is burned. The shape of the particles and their composition make fly ash an excellent additive to concrete. The spherical shape improves workability and decreases the permeability, while the minerals can improve the long-term strength of the concrete. Similarly, the shape and chemistry of the ash lends itself to use as a fill material in flowable fill or controlled low strength material. Bottom ash is similar to fly ash in composition, but it is composed of heavier pieces that are collected from grates beneath the furnace. The ash has a coarse granular composition that makes it good for use as a coarse aggregate material. The bottom ash is strong and drains well, so it is often used for road base, embankment and structural fill applications.

FGD materials are produced during the removal of sulfur dioxide (SO₂) from gas emissions produced by burning coal, as mandated by the 1990 Clean Air Act. There are many different technologies for removing SO₂, but in general an alkaline material like lime or limestone is introduced into the flue gases to capture the SO₂. The alkaline material reacts with the SO₂ gas to form calcium sulfate (gypsum), or calcium sulfite, which is usually transformed into calcium sulfate. The primary use for FGD materials is the production of wall board, which uses gypsum. In 2006, more than 7 million tons of FGD gypsum was used to make wall board. In addition, FGD materials have been used in embankments and as feedstock for cement production.

Environmental Benefits

Studies and research conducted or supported by Electric Power and Research Institute (EPRI), government agencies, and universities indicates that the beneficial uses of coal combustion products in highway construction have not been shown to present significant risks to human health or the environment. But, as with many other common substances, precautions and sound management practices should be applied when using coal ash in unencapsulated uses. Water and air are the two media most likely to be affected by coal ash or coal ash constituents. Ingestion, inhalation, and skin contact are the ways that humans and other living things could be exposed to coal ash. Other issues that may need to be addressed are leaching of elements such as mercury and metals into ground water, contamination of vegetation and the impact of other elements on the food chain, and air-borne dust. In most cases, however, the way that coal ash is used, the engineering requirements for that use, and the handling and management methods applied minimize exposure to the ash.