Development of Novel Paperless Wallboard from Sulfate-Rich FGD Material

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ABSTRACT

It is estimated that about 24 million tons of flue gas desulfurization (FGD) byproducts were produced in the USA in the year 2000; 7.2 million tons were sulfate-rich FGD material (synthetic gypsum), used mainly in the wallboard industry. Almost 30% of the synthetic gypsum was left unsold, due to the rural locations of the electric utilities and/or a lack of an effective transportation infrastructure. This material is usually landfilled. The authors have been developing value-added materials from wet, sulfate-rich FGD material, such as countertops, decorative tiles and paperless wallboard materials as an environmental and economical conducive alternative to landfilling the FGD material. This paper will present the results of a two-year research project into the development of paperless wallboard.

In the pursuit of the development of novel, paperless wallboard from wet sulfate-rich FGD material (sludge), the influence of the following factors on the strength and the physical properties of the wallboard were systematically examined: water-to-sludge ratio, plaster-to-sludge ratio, fly ash-to-sludge ratio, hemihydrate formation pressure, and the addition of natural proteins, natural fibers and commercial chemical additives to the formulated FGD mix. Paperless wallboard of two feet by four feet was successfully produced. The research results suggest that when sulfate-rich FGD gypsum is processed along with natural fibers and proteins, two distinct types of paperless wallboards are possible: a high strength wallboard (5 to 8 MPa, compared to the 2 to 3 MPa strength of a commercial papered wallboard) and an extra high strength (15 to 40 MPa) wallboard.