WATER RESISTANT CEMENTITIOUS ARTICLE AND METHOD FOR PREPARING SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

This patent application is a divisional patent application of U.S. patent application Ser. No. 11/738,316, filed on Apr. 20, 2007 which claims the benefit of U.S. Provisional Patent Application No. 60/889,487, filed Feb. 12, 2007, the entire disclosure of both of which preceding patent applications are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

Cementitious articles, such as gypsum board and cement board, are useful in a variety of applications, some of which require a degree of water resistance. Traditional paper-faced cementitious articles do not always perform well under high moisture conditions, or upon exposure to the outdoors. Thus, for such applications, it is often desirable to use a cementitious article that is faced with a glass or polymer-based fiber mat instead of paper. It also is advantageous to use additives in the cementitious core that improve the water resistance of the core material itself.

The manufacturing process of cementitious articles, such as gypsum board and cement board, typically involves depositing a cementitious slurry over a first facing material and covering the wet slurry with a second facing material of the same type, such that the cementitious slurry is sandwiched between the two facing materials. Thereafter, excess water is removed from the slurry by drying. The cementitious slurry is allowed to harden to produce a solid article prior to final drying.

The manufacturing process of cementitious articles, thus, often requires the facing material to be sufficiently permeable that excess water can be removed from the cementitious slurry in the drying process. For example, non-woven fiberglass mat is often used as a facing material, in which the space between the fibers provides permeability. The permeability of the fibrous facing materials, however, makes the manufacturing process more difficult because the cementitious slurry deposited on the fibrous mat facing material tends to penetrate the mat causing slurry build-up on the forming table and assembly line. The slurry build-up must be removed periodically. Increasing the viscosity of the slurry can reduce the amount of slurry that penetrates the fibrous mat facing material, but the required higher viscosity is not always optimum for use in existing plant production processes due, for instance, to changes in mixing, setting, drying, or hardening characteristics.

Furthermore, the permeability of the fibrous mat facing material also reduces the water-resistance of the cementitious article because it allows water to penetrate the mat and contact the cementitious core during use. In order to alleviate this problem, exterior coatings of hydrophobic resins are sometimes applied. However, this generally requires an additional post-manufacturing step to be employed, adding cost and inconvenience.

Another approach is to further increase the water resistance of the cementitious core material by including hydrophobic additives in the cementitious slurry. A preferred additive for this purpose is a siloxane oil. However, methods of employing such additives require further improvement in their implementation and effectiveness.

Thus, there remains a desire for new water resistant cementitious articles, as well as methods of preparing such articles.

BRIEF SUMMARY OF THE INVENTION

In one aspect, the invention provides a fibrous mat-faced cementitious article comprising (a) a cementitious core, and (b) a first fibrous mat comprising polymer or mineral fibers and a hydrophobic finish on at least one surface thereof, wherein the hydrophobic finish is in contact with the cementitious core.

In another aspect, the invention provides a method of preparing a fibrous mat-faced cementitious article comprising (a) depositing a cementitious slurry on a first fibrous mat comprising polymer or mineral fibers and a hydrophobic finish on at least one surface thereof, wherein the cementitious slurry is deposited on the hydrophobic finish, and (b) allowing the cementitious slurry to harden, thereby providing a fibrous mat-faced cementitious article.

In another aspect, the invention provides a method of preparing a water-resistant cementitious article comprising (a) preparing an aqueous siloxane dispersion comprising about 4 wt. % to about 8 wt. % siloxane in water, (b) combining the siloxane dispersion with a cementitious mixture to provide a cementitious slurry, (c) depositing the cementitious slurry onto a substrate, and (d) allowing the cementitious slurry to harden, thereby providing a cementitious article.

These and other advantages of the present invention, as well as additional inventive features, will be apparent from the description of the invention provided herein.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments of a fibrous mat-faced cementitious article according to the invention comprise (a) a cementitious core, and (b) a first fibrous mat comprising polymer or mineral fibers and a hydrophobic finish on at least one surface thereof, wherein the hydrophobic finish is in contact with the cementitious core. Desirably, the hydrophobic finish prevents the cementitious core of the article from penetrating the first fibrous mat to any substantial degree during manufacture.

The first fibrous mat comprises any suitable type of polymer or mineral fiber, or combination thereof. Non-limiting examples of suitable fibers include glass fibers, polyamide fibers, polyaramide fibers, polypropylene fibers, polyester fibers (e.g., polyethylene teraphthalate (PET)), polyvinyl alcohol (PVOH), polyvinyl acetate (PVAc), cellulosic fibers (e.g., cotton, rayon, etc.), and the like, as well as combinations thereof. Furthermore, the fibers of the mat can be hydrophobic or hydrophilic, coated or uncoated. Of course, the choice of fibers will depend, in part, on the type of application in which the cementitious article is to be used. For example, when the cementitious article is used for applications that require heat or fire resistance, appropriate heat or fire resistant fibers should be used in the fibrous mat.

The first fibrous mat can be woven or non-woven; however, non-woven mats are preferred. Non-woven mats comprise fibers bound together by a binder. The binder can be any binder typically used in the mat industry. Suitable binders include, without limitation, urea formaldehyde, melamine formaldehyde, stearated melamine formaldehyde, polyester, acrylics, polyvinyl acetate, urea formaldehyde or melamine formaldehyde modified or blended with polyvinyl acetate or acrylic, styrene acrylic polymers, and the like, as well as combinations thereof. Suitable fibrous mats include commercially available mats used as facing materials for cementitious articles.