Design advantages—and their long-term aesthetic results—are key considerations when an architect or building owner chooses an exterior insulation and finish system (EIFS) over competitive materials.

Advances in EIFS design elements, such as improved resistance to color fading and mildew, can only lead to greater EIFS market share. This means more business for the EIFS contractor 3, 5, 10 and 20 years from now—when the long-term aesthetic and economic results of a well-designed EIFS installation are compared to those of natural or painted brick, wood, concrete or other materials popular for exterior walls.

Europeans, who introduced EIFS to America in the late 1960s, long have relied on relatively bright colors for EIFS design versatility. While Americans generally favored more neutral colors, sometimes combined with bold accent colors and/or decorative EIFS shapes, the American passion for the ultimate in ease of maintenance has led to significant technological improvements in fade and mildew resistance.

Those improvements and the principles behind them are the subject of this two-part article. We will discuss fade resistance in Part I and address advances in mildew resistance in Part II.

While other factors (chalking, for example, which sometimes is mistaken for fading) may affect the defacement of wall finishes, true fading and mildew represent the greatest challenges.

Fade resistance

One of the great advantages of EIFS is that its color is not applied at the surface, but is inherent throughout the material (although it is possible to refresh or change the color with a special surface application). It looks nearly the same after 20 years with only occasional cleaning, while a

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Painted surface will require cleaning, sanding and repainting every five to 10 years. Nevertheless, although EIFS color is blended throughout the finish material, part of that color is exposed at the surface and brighter colors, in particular, can be subject to some fading. Now, advances have brought us to the point where even some relatively bright colors can be used with assurance of long-lasting fade resistance. This improved resistance to fading results not only in better long-term color stability, but also in better color matching when an EIFS building is retrofitted with an addition. To understand how better fade resistance is developed, it is necessary to understand a few basic principles of color.

**Color formation**

Colors for exterior insulation and finish systems, similar to those for paint, are formulated from pigments (inorganic or organic) and binders (encapsulating agents for the pigments). Extenders (inorganic fillers) are a third category of ingredient that often are added to supplement expensive organic pigments and impart other properties. In addition to these three basic ingredients, several other types of materials are used to modify the resulting compound. These may include such ingredients as preservatives to inhibit mildew growth, dispersants to prevent agglomeration of pigment, and glycols to modify the rate of drying. They may also include rheology (flow) modifiers and thickeners to control viscosity, plasticizers to make hard resins flexible, wetting agents for better adhesion to difficult substrates and anti-foaming agents to aid in manufacturing. Any of these chemical additives can affect the pigment and its binder, the primary ingredients of concern in fade resistance.

Color, at its most elementary level, is determined by the way light is reflected from and/or refracted through a material. Different wavelengths of light produce different colors. When sunlight (which contains all the wavelengths, or colors, of the spectrum) hits various materials, different wavelengths are refracted and reflected, making specific colors visible. Making a color fade-resistant really means making a material very stable so it will always reflect approximately the same wavelength of light. The color fastness of the material might be thought of as “light fastness,” or color stability.

Particles of various pigments are characterized by different shapes, surface chemistries and refractive properties that determine which wavelength, or colors, they will refract, reflect or absorb. The shapes may be round, flat or needle-like, for example. The purpose of a binder in this case is to encapsulate the particles of pigment, to protect them and to hold them together.

The chemical nature of the pigment chosen must be stable. It must not be easily degraded by ultraviolet (UV) light. It must be chemically compatible with and have a certain tenacity for the binder. The pigment must be “wettable” by the binder. For example, with needle-shaped particles, the binder must not just wet the end surface of the pigment particles; it must get into the crevices between particles and thoroughly surround each one.

Since manufacturing economics dictate the use of a single binder, the same binder must be adjusted to be compatible with many different pigments. A particular wetting agent, for example, will make certain pigments more compatible with the binder. Sometimes, however, added chemicals can interfere with specific pigments, causing them to become less stable over time and to fade.

**Pigment selection is key**

Pigments, therefore, must be selected very carefully. This is especially true of organic pigments, which are often used for blues, greens, bright reds and bright yellows. As mass tones, they may be quite stable in a particular binder, but when white is added to produce a pastel shade for a building --even a bright pastel--the formulation turns much less stable and will easily fade. Azo yellow, a very bright organic pigment, is a case in point.

Another way of producing pastel yellow might be to use an inorganic yellow. Although the inorganic yellow is quite dull, white can be added to make a pastel that won’t readily fade. To achieve a brighter effect, the dull inorganic yellow may be blended with the organic Azo pigment. The inorganic yellow “props up” the color, producing a fairly bright yellow pastel that resists fading much more effectively than the Azo yellow alone.

Inert pigments are another source of concern. These substances--aluminum silicate (clay), silicon dioxide (sand) and calcium carbonate (chalk), for example--don’t contribute color per se but do affect the relative degree of transparency or opaqueness. Inert pigments can react very strongly with rheology modifiers to reduce fade resistance that is noticeable in a matter of days.

A manufacturer’s choice of higher-quality organic and inert pigments and careful attention to reactive chemistries are determinant factors in preventing such short-term as well as long-term fading.

**Testing for optimum results**

With about 25 factors to consider in the formulation of each color, and the innumerable effects that any combination of factors can produce, only aggressive research and development and thorough testing programs can reliably improve fade resistance. At Senergy, for example, a concerted R&D effort has been made over the last several years, resulting in a wider choice of accent colors that have proven to be highly fade-resistant. Some of the results of Senergy tests will be discussed along with mildew resistance in Part II of this article.

**About the authors:**
Paul Pattek is the Executive Vice President and John Patrick the Director of Research & Development at Senergy, Inc.