

## **Alternative cladding technology and its compatibility with environmental sustainability goals**

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### **Abstract:**

Environmental sustainability is: "The ability to improve the quality of human life while living within the carrying capacity of ecosystems." Sustainable development and environmental sustainability are related to preserving the environment from the causes of pollution, which comes within the environmental sustainability criteria.

Environmental sustainability aims to: preserve natural resources, save energy and water resources, and create environmental conditions for economic development by providing job opportunities, while minimizing damage to the environment.

It is possible to produce industrial materials used in architectural claddings, with good industrial specifications, made from renewable local materials, which work to rationalize the consumption of natural resources. They are alternative cladding products.

Alternative cladding products are based on environmentally available raw materials such as Cement, Gypsum and Plastic. It is used in the manufacture of exterior and interior cladding products that look similar to natural materials such as stone, rocks and wood....

Alternative cladding products are three types: glass fiber reinforced cement (GRC), glass fiber reinforced plastic (GRP), and glass fiber reinforced gypsum (GRG). The implementation of alternative products depends on the mold technology in production, the installation is done by mechanical fixing units on the facades or by fixing with mortar. These products have good industrial specifications such as, toughness & durability and have variable environmental impact.

Compounds as cement & polyester have a harmful environmental impact, so it is preferable to either improve their properties or replace them with other less harmful materials on the environment. With the necessity to follow precautions when using, and to apply environmentally friendly technology, with the possibility of recycling some products, such as the manufactured gypsum.

Other alternative cladding products that have the appearance of natural stones are artificial stone & artificial rocks and stone walls, they are used in wall and floor cladding, with good industrial specifications, and local ingredients.

Alternative cladding tiles have been produced with the appearance of natural materials, suitable both internally and externally, using rubber molding technology, from local ingredients and environmentally friendly, therefore they are "sustainable products."

### **Keywords:**

Alternative cladding products, environmental sustainability, fiberglass, environmental impact, sustainable products.

## Introduction

Architectural claddings are the materials and products that cover internal and external architectural surfaces such as wall cladding, ceilings, floors, facades, entrances...., to give them an aesthetic appearance and to isolate them from the influence of weather factors and moisture, as well as to increase their strength and components. They are either made of natural materials such as stones, marble, granite and minerals. ... or combined with manufactured materials such as glass or paints..... Therefore, they are consumed in huge quantities, causing an environmental problem, as the consumption of these natural materials and the failure to legalize their consumption constitutes a danger to the system and ecological balance, as it drains the country's non-renewable natural resources. Therefore, the research behind the production of industrial materials to replace natural materials was sought. This is represented in the manufacture of products similar in appearance to natural materials and with good industrial specifications, and made from renewable and environmentally available local materials, working to reduce the depletion of natural resources and rationalize their use. It is what is called environmental sustainability.

Environmental sustainability aims to protect the environment and maintain public health and ecological balance on the planet. And creating innovations that do not affect our way of living and our environment. Sustainability is related to the design processes and implementation technology to reduce the destructive impacts of the environment by integrating them into the development and manufacturing processes. Especially the link between economic development and the preservation of the environment, but the problem is that the increasing economic activities depend on the depletion of the natural resources of the environment. Hence the idea of alternative coatings emerged, which are manufactured products similar in appearance to natural materials. These alternative products depend on environmentally available raw materials such as cement, gypsum and plastic with good industrial and environmental specifications, despite the fact that these products depend on some environmentally harmful materials such as polyester or Poor cement... that does not conform to the conditions of sustainability, but on the other hand, it preserves the environment's resources, so how can this contradiction be resolved?

The alternative coatings products are divided into three main types: Glass Fiber Reinforced Cement (GRC), Glass Fiber Reinforced Plastic (GRP) and Glass Fiber Reinforced Gypsum (GRG).

These types are sometimes similar in components or sometimes manufacturing stages, while they differ in their specifications and uses, and some of those coatings are used internally while others are externally.

### **Research can apply the sustainability goals in the following:**

- Applying clean technology in manufacturing processes, a technology that achieves economic results and has a limited environmental impact within the carrying capacity of the environment. Providing sustainable products from alternative coatings, similar in appearance to natural materials.

### **Research problem:**

What are the alternative coatings products, and what are their components?

Do alternative coatings products cause environmental pollution?

What are the general specifications for the types of alternative products?

**research importance:**

Defining environmental sustainability and its objectives.

Knowledge of the technology of manufacturing alternative coatings.

- Uses of alternative coatings.

**Research goal:**

- The environmental impact of those products during production and manufacture.

Application of sustainable coatings products.

Research Methodology: The research follows the theoretical approach in explaining the presented theoretical material, and the (applied) approach in providing applied experiments for one of the alternative coatings products.

The world has begun to recognize the close link between economic and environmental development, and specialists have noticed that the traditional forms of economic development are limited to the over-exploitation of natural resources and at the same time cause great pressure on the environment as a result of the pollutants and harmful waste that they produce that have caused many environmental problems. To "sustainability" to solve these environmental problems at various levels.

**Results**

1. Environmental sustainability aims to:

- a. Preserving natural resources and saving energy and water resources.
- b. Create environmental conditions for economic development and job opportunities.
- c. Reducing pollution and harm to the environment.

2. A comparative study was made between the different types of sustainable coatings, clarifying their properties, uses, environmental impact and implementation technology.

3. The most sustainable types of coatings have been identified, namely Cement Reinforced Products (GRC), Reinforced Plastics (GRP) and Gypsum Reinforced Products (GRG).

4. Artificial stone, rock walls, and printed cement floors are alternative products that achieve environmental sustainability.

5. Alternative products are considered sustainable products because: they do not only reduce the use of natural resources and not deplete them, but they also give an appearance similar to the appearance of natural materials and raw materials. These products also have good industrial specifications with varying environmental impact.

6. Some applications have been made to show the importance of sustainable cladding, which is an "alternative wall cladding slab for natural stones" with clean technology and environmental raw materials.

7. The conditions for the success of the implementation of the alternative stone slabs were determined, which are: the quality of the mold, the components of the casting mixture, the percentages of colors added.

## Recommendations

1. I recommend building materials manufacturing enterprises to manufacture alternative cladding products with modern technology and in compliance with standard and environmental specifications.
2. I recommend research and educational bodies to provide more research in the fields of manufacturing "sustainable coatings" and achieving environmental sustainability goals.
3. I recommend industrial raw materials manufacturing enterprises to use clean technology that is not harmful to the environment.
4. I recommend the production of raw materials to provide local industrial materials for the continuation of the manufacturing processes of alternative coatings and not to deplete the environment's resources.
5. I recommend the Ministry of Planning to work on "future sustainability" concerned with developing new, clean technologies and considering them within the objectives of environmental sustainability.
6. I recommend the regulatory authorities to provide environmental control over the production stages of raw materials or the stages of manufacturing alternative coatings products.
7. I recommend university education institutions to pay attention to inventing new technologies that preserve the environment.

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