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The Qualitative Improvement of Urban Facade and Landscape in Religious and Historic Textures by Taking Advantage of Visual and Climate Features of Nano-Materials

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Abstract—*Urban facades and landscapes are considered the most important elements to become familiar with the characteristics of a city perspective. In most cases, these bodies represent the monuments and buildings which are located in the background. In recent days, we have witnessed developments in this sector that necessity and special significance for the study have created. Diversity of construction along with materials that are used in municipal buildings has caused that urban facades in a coherent contemporary are not adequate. Municipal bodies are generally formed of glazed buildings; walls which windows and building facades have placed in their structure, in contemporary times, the quality of the urban body are severely reduced because the selection of facade materials and type of windows creates on the basis of giving priority to the economic and profitability dimension in manufacturing construction and individual taste, the taste which is the only the result of consensus for the builder and employer. In this selection, factors such as cost of materials and windows, the cost of skilled workers in implementing the facade or window and the cost of installing and running windows, appropriate and effective use of materials in the scene and the body are limited. Generally, in the selection of materials for facades and windows, from factors such as appearance in the long-term and fitting it against atmospheric factors in the energy transfer between the interior and exterior building wall and also the cost of building energy consumption are considered, while the façade of the building is the most important aspect to show the building in the public domain and it is an important issue.*

Keywords*: Facade, Nanomaterials, Sustainable development, Urban view, Smart materials.*

Problem statement: (explanation about the different aspects of the topic)

Our cities are independent and in addition to the events and relations formed in political, economic, cultural and physical fields of are eligible which they are a container of citizenship behavior. Although the containers are apparently serving these behaviors, many studies have proved that the behaviors also influence their container. These containers are physical formats which provide situation of realization of citizenship behaviors in the form of vertical and horizontal surfaces – in the primary way and in more sublime way, elements of identifying the city are affected the perception of citizens. These physical forms are made of elements that are called building materials. From another view, what is understood by the citizens of the city at first sight is an accumulation of building materials placed in the form of volume packages. A review of past Iranian urbanization and architectural history and the study of examples of religious architecture such as Mosques, Hosseinieh, Takaya, monuments and non-religious architecture such as inns, schools, houses, hospital and textures around them make clear us in such as a way that cities in the interactive relationship between social and ecological requirements with materials supplied in the region have formed that this indicates building structural importance in forming Iranian cities.

The process of architecture and technology in recent decades has moved in the direction of overcoming nature, while in the course of history scientists were studying the nature of science to advance technology. But it seems that in recent decade, new technologies and smart materials by utilizing the elements of nature are trying to go along with nature. Examples of this claim can be found in self-cleaning materials and glass light and heat controller. This time, technology sees ahead nature and in keeping with the nature tries not overcoming it.

1. INTRODUCTION

Nano and smart materials

Vulnerable textures with poor figures affected the quality of urban public space and desire to live in these tissues is destroyed. In this regard, the use of new materials and especially smart materials can be taken into account as an effective strategy to improve the urban landscape because the discovery of new materials has emphasized on new possibilities for the industry in general and specifically with the construction industry as far as naming historical periods

based on human access to materials and elements found are created in that case such as the Stone Age, Metal Age, the Age of materials and supplies etc. In this chapter, the relationship between materials and architectural importance and necessity of using new materials in architecture are expressed.

In the process of discovery and development of new materials, smart materials are introduced as a logical development of materials and new achievements. Smart materials or reactive substances are the substances which show a reversible response against environmental stimuli. The new materials which are considered a part of technology due to the specific capabilities, until now, the knowledge of this group of materials are not formed.

Materials and historical eras

Generally, "according to the period of human achievement to material elements discovered, human life is divided into periods; at the same time the most important and useful human findings is the appellation of the same period. Historical eras have been initiated from the Stone Age and they are Bronze Age, Iron Age etc. According to discovering smart materials and potential capabilities, new era is called an age of "smart materials" (Araee, 2009).

As it can be seen, over time, the human findings such as new materials are of even greater complexities. Smart materials are considered as one of the newest materials present, one of the most complex materials.

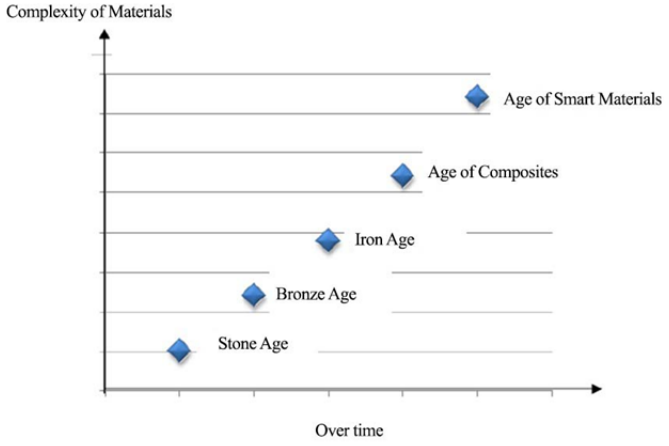


Fig. 1: The relationship between the complexity of materials and time (author).

The relationship between materials and architecture throughout history

The relationship between materials and architecture was a simple relationship before the industrial revolution because in this regard, there was not an advanced transportation system; therefore, local materials should be used in making buildings. Native materials were chosen either based on performance and for their accessibility or they are used based on their decorative appearance (Addington & Schodeck, 2005).

But with the advent of the industrial revolution, the role of architectural materials significantly changed so that they can be faced with materials engineered and design instead of knowledge of intuition and experience about the properties and performance of materials. Also, the expansion of transport system provided the transfer of materials to various locations. Therefore, the beginning of the material history of architecture can be introduced with the introduction of the world's steel (Ibid).

With the advent of the industrial revolution, new materials were introduced that had specific functionality and provided facilities that there were not prior to this period. New materials created both in structure and in façade this means that with the discovery of steel, the possibility for building high-rise buildings also the construction of large openings in the building were provided, something that was not possible in previous periods. Also, in the facade of the building, the possibility of constructing clear buildings in all climates was provided because industrialization of glass productions with advanced air-conditioning systems made possible international style in which transparent architecture the potential at each site, climate and texture, something which was not possible before (Araee, 2009).

Table 1: Developments in the construction of the building (after the Industrial Revolution).

Developments in the construction of building (after the Industrial Revolution)	Developments in the construction	Construction of high-rise buildings
		Construction of building with large openings
	Developments in the facade	The formation of new materials for facades, such as concrete, etc
		Extensive use of glass in buildings in different climates
		Construction of building with completely glass facade

While science has offered a lot of technology to forms, in some fields of design and architecture in particular, benefit from modern technologies and changing materials are less common because we are still using framing systems in buildings which was an industrial revolution. Perhaps the formation and development of smart materials in architecture can be regarded as a turning point in the architecture and construction (Addington & Schodeck, 2005).

The importance of new materials in architectural history

Industrial developments and promotion of human knowledge is led to supplying new materials. With the discovery of new materials, turning point in history is formed. Gideon believes that the development of modern industry is essentially related to the materials (Qobadian, V. (2001).). At the same time, the

material industry has created new capabilities. This is also true in the field of architecture so that Dingtone says: modern architectural history can be viewed through the lens of architecture materials (2005) Qobadian, V. (2001).. Discovery and invention of new materials provide new possibilities resulting in forming a change in trend of history if with the advent of Industrial Revolution and the discovery of steel and concrete, the possibility of tall buildings was provided. This possibility was not available prior to this period. Murray on the importance of new materials in the history of architecture is believed that the invention of steel and concrete has changed architecture. Nowadays, smart materials with efficient capacity and potential have also created changes in constructions and they provide new and different facilities which can be regarded as another milestone in trend of history and architectural history. Turning from the industrial age to the information age and the number of elections is a sensible issue as a result of thinking smart materials as alternatives for building materials, but factors such as the cost of access, easy replacement of smart materials instead of conventional building materials are limited. In these circumstances, to use them, we should not expect to reduce the cost of materials, but it is better to examine the capabilities and characteristics and to take full advantage of them, we find a method to achieve our goals. Consequently, to extend their application, the reduction of costs occurs.

In this regard, the architects have tried to put the concept of smart materials in addition to traditional building materials. But it should be noted that smart materials are different from the ordinary materials in their structure. Building materials are conventional, standard and are static and they must resist against the forces of construction, but smart materials are dynamically and they react against in response to the flow of energy. On the other hand, the use of smart materials is new and several new facilities are provided that there was not occurred previously. For example, photovoltaic cells, which are the typical smart materials, produce electrical energy from light. The event was not previously possible long-conventional materials.

Image 1: Electrochromic glass (Science of Architecture, 2008).

Therefore, they cannot be considered as alternative to conventional materials. Also, even if intelligent materials can today be considered a proper substitute for material combinations, since they have an active nature, they are considered as a part of technology not materials.

For example electrochromic glass can simultaneously play the role of light materials, windows, curtain wall, and the control system of light or automatically shade system. While it is not possible to replace this operation using common materials, and it is the need for systems designed. A review of recent experiences of architecture show that architecture needs to adapt to new technology for the promotion as from the distant past, these two have had a profound link together. Therefore, in future exploration in the field of smart materials and new technologies we must be sensitive to the challenges and the main barriers must be identified in the execution context. Then, by identifying constraints and opportunities, an appropriate solution can be adopted to solve challenges and development.

Table 2: Swot table for smart materials (author).

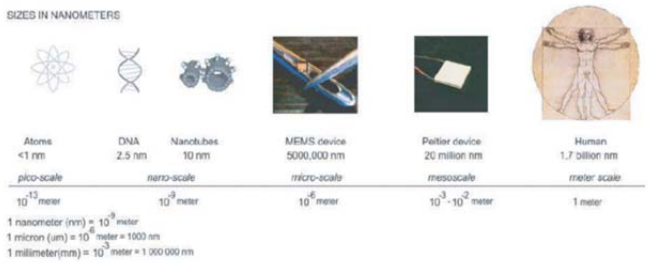
Strength	Opportunity	Weakness	Threat
Multiple applications (thermal comfort, visual, etc.)	The diversity of new materials with diverse capabilities	Lack of people awareness of them	Long process of standardization
Interests of new generation	Clear vision	Performance problems in the laboratory level in Iran	
High versatility with the environment	Context of research and multiple studies	Lack of samples made using these types of materials	
	Shaping new industries		

Nano and smart materials

Because of widespread use of nanomaterials in all areas and also passing from laboratory process and achieving to the field of manufacturing and using in projects as visual examples and mass production, the issue of nanotechnology is well-known. Generally, nanotechnology makes possible that the feature of materials is programmed at the nanoscale. The basis of the subject of nanotechnology is different production of the materials. Therefore, perhaps the relationship among materials is to change the chemical composition of the materials. Smart materials with Nano materials are the first question is to be formed in the mind (Iranmanesh, 2009).

In this regard, it should be noted that the constituent particles of these smart materials may be at the nanoscale. However, smart materials and nanomaterials are two very different things. The prefix of Nano is to determine the scale and compact objects and things that deal with nanotechnology,

while smartness refers to responsive features to environmental stimuli during reversible mechanism. On the other hand, in smart materials, responding to stimuli occurs in micro-scale mechanism (Addington & Schodeck, 2005). However, smart materials and nanomaterials are two different topics. In the Table below, the relationship among the scales are well expressed.



The relationship among the scale of meters, micrometers and nanometers (Addington & Schodeck, 2005).

Thermodynamic scale	Length scale (meters)	Boundary process
Macro-scale	cm to m+	Convection
Meso-scale	mm to cm	Conduction
Micro-scale	μm to 0.1 mm	Radiation
Nano-scale	pm to nm	Non-continuum

Different scales and scope of their operations (Addington & Schodeck, 2005).

What is nanotechnology?

Nanotechnology is the name that refers to a type of production technology. As it is clear from the name, this is met when there is an ability to make objects of atoms and in this case, the ability to make re-arrangement of materials is created with atomic precision (Akhavan et al., 2001).

The goal of nanotechnology is to make to future molecule. As mechanical means produce a force beyond human physical force, nanoscience and production in atomic scale also cause that human take step beyond the limits which are naturally available and exactly he does changes on structural units of the materials, where the material properties are determined.

The nature of Nanotechnology is the ability of working in atomic, molecule alignment and beyond it at dimensions between 1 and 100 nanometers, with the aim of the construction and manipulation in the arrangement of atoms or molecules and using materials, equipment and systems with new capabilities. Here, some examples can be cited to better understand this scale.

A water molecule is about one nanometer in diameter. A single-layer carbon nanotube diameter is 1.2 nm. The smallest transistors are 20 nm. DNA molecules have 2.5 nm wide and proteins are between 1 and 20 nm (Secretariat of the Congress of Nanotechnology, 2001).

As it was mentioned, all materials and systems arrange their underlying structure at the nanoscale and the aim of nanotechnology is to change these structures and achieve greater returns from this process.

Pioneers of Nanotechnology

Forty-seven years ago, theoretical qanto specialist and Nobel Laureate, Richard Feynman, discussed on the study of underdeveloped dimension of science in a famous speech in 1959 entitled "there are a lot of spaces". He was hypothesized that if scientists learn that how to make transistors and other small-scale structures, then, they can be made smaller in the future.

In fact, the materials will become close at the edge of quantum uncertainty to their actual border and the atom is greatly unstable and incomprehensible only when shrinking is stopped (Shahverdi & Maghrebi, 2004).

Feynman assumed that when the language or genre atoms was discovered, detailed design of molecules will be possible so that an atom is placed against the other that the smallest possible artificial product may be created

In the midst of the industrial age, the word "big" was of particular importance. Great science, great engineering projects and so on, even the personal computer in the 1950s occupied all floors of the building but since Richard Feynman said his controversial comments, the world adopted a trend toward shrinking ().

Nano and its nature

The nature of Nanotechnology is the ability of working in atomic, molecule alignment and beyond it at dimensions between 1 and 100 nanometers, with the aim of the construction and manipulation in the arrangement of atoms or molecules and using materials, equipment and systems with new capabilities (

In these tiny dimensions, biological and physical-chemical properties can be achieved (

At this scale, the reaction can be done faster and more efficiently and sustainable products also arise and the main danger of this technology is also in this smallness and stability ().

The impact of Nano on the environment and sustainable development

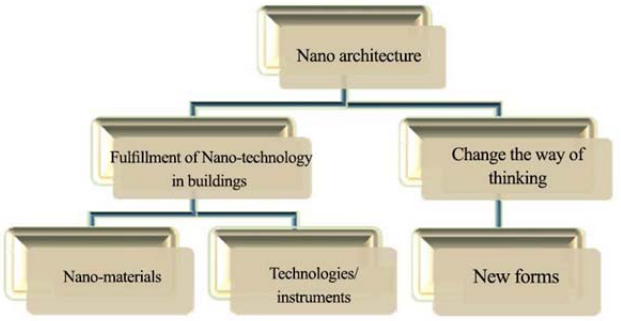
Energy from the sun can meet our needs 10 million times more than fossil fuels. Today, light plates which are cheap and

have a higher efficiency are in progress using nanotechnology in progress. The equipment for small units can be used at house. This equipment emits good light, so this is also useful in cloudy weather. Using these technologies, valuable areas do not turn into arid places anymore and the quality of life quickly recovers for most people. Through Nanotechnology, better batteries and capacitors can be made that they are environmentally friendly. Also, the damage to the environment should be reduced, especially toxic materials which they are the ones used in solvents. Nanotechnology can result in eradicating these materials through the creation of new materials and Nanostructured surfaces that they effectively promote the excretion of emissions. In order to prevent corrosion, metal covering has much impact on the environment (

Application of nanotechnology in the development of other technologies has an important impact on the health and welfare of the people. Today, different countries have achieved by enjoying the technology and its integration with other specialties that production costs and less maintenance, low energy consumption and longer life are the most important of them ().

Nano architecture

Nano architecture is the architecture change as a result of new Nano revolution in the 21st century. The use of nanotechnology in architecture includes a wide range of materials to constitute equipment, forms and design theories

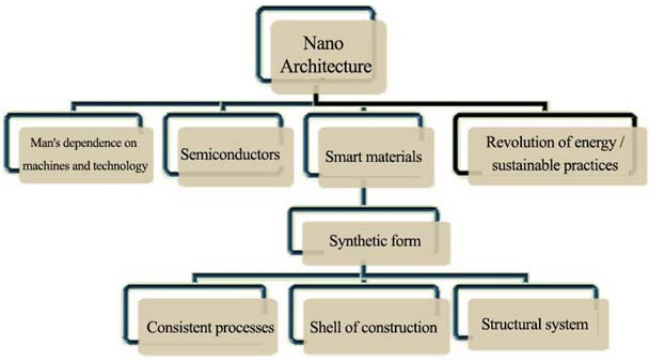


(Elsamny, 47, 2008)

Fig.

Another definition of Nano architecture

The biggest design our future built environment are certainly very small



(Hemeida, 2010, 33).

Nano technology and architectural design

In the future, the biggest plans for making the environment will be very small (Limit et al., 2001).

Small designs presented on the issue of nanotechnology and its impact on the human environment can be predicted in three stages:

First, what role does Nano-technology play in architectural design today? There are now some materials with Nano-engineered structures available for architects and builders to use in buildings, which transformation of buildings with the use of this material has been much discussed. Some examples of products that are in production include thin and protective transparent layers of windows that are resistant to scratches and they clean them automatically using the ultraviolet radiation of the sun and rain, the glasses which change their color by raising or lowering ambient temperature and set the light of the environment and concretes are resistant against bumps and cracks and although they are valuable and they have not produced, and they have used in some buildings, such as the National Building Standards and Technology in Maryland America.

Image 1: National Building of Standards and Technology in Maryland of America

Second, with a more wide view, an effort today for nanotechnology specialists is acquired in the next 15-20 years that an obvious example is that carbon nanotubes which provide strength and capability of unparalleled flexibility for buildings and promises tips for new forms, new functions and new connections among people, buildings and the environment.

And third, in the distant horizon we can see that pervasive impact of nanotechnology on human life and how to communicate with the surrounding environment and buildings will be inevitable and unthinkable. Shielding skins against the sun, invisible walls and a copy of the germ, all are places in the territory. Social, ethical and environmental changes apart of this evolution will not be possible

Nano technology creates fundamental changes using the structure of human life. For example, if someone has a skin protection against solar heat, what happened for the buildings? And if walls and roofs are covered from thin insulation invisible moisture papers, what relationship there will be between human life and the environment?

Perhaps some predictions about nanotechnology seem exaggerated, but its ultimate goal is to create detailed materials with diverse properties.

The famous words of English statesman, Winston Churchill, which he said: "we shape our buildings, and (mutually) buildings shape us. This was prior knowledge of nanoscience but perhaps its power is clearly predicted in changing the shape of the building and consequently the man that how by controlling for nanotechnology on raw materials for people's spaces (materials) and the unrivaled power which they are at the possession of architects to design the lights and stoves heterogeneity, the form of human life and connection with the world around will change him. Therefore, designers today trying to assess the achievements of science in the areas of personal, social, moral, etc., seems completely necessary because configuring a sample of healthy human and decent living space, through the initial thinking, discussion and conclusions will help to develop informed this knowledge in the future.

Nano architecture, flexible and accommodated architecture

Organic architecture, which is defined by Frank Lloyd Wright as adjustment of the buildings based on the placement in nature, is discussed today within the framework of sustainable architecture and new horizons, nanotechnology (Table1).

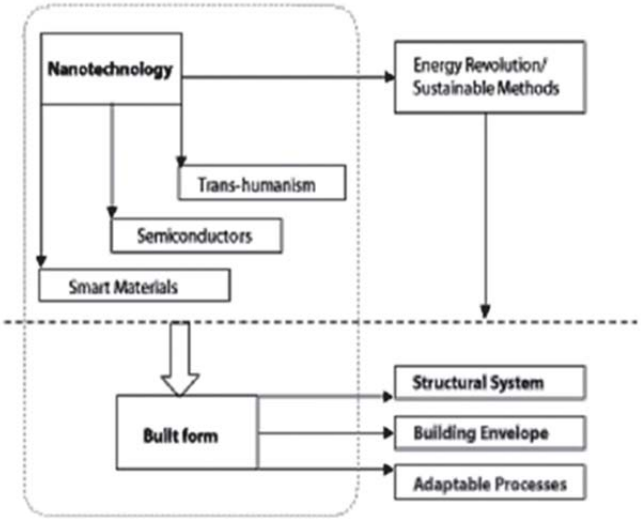


Table 1: Source: Nanotechnology and Architecture Magazine (http://www.nanotchnologyandarchitecturre.com).

Wright believed that the form of the architecture must arise out of the nature of things and each object in turn has a particular language to speak and express feelings. For example, proportions, layout and texture of brick of House Ruby show spreading over the vast horizon. Baked brick is derived from the nature and returns again. Now imagine the time that the constituent materials of the house are too small to be seen with the naked wool, and then imagine that what the relationship among forms, humans and the environment will change.

Since using nanotechnology achievements of a thing - the building at different times and places can show different behaviors - uncompromising, hard or soft, fluid - generally cognitive theories of materials are transformed.

In fact, materials lose their identity and architecture will not have a limited definition in time and space anymore.

The behavior of structures and buildings are completely performance-oriented and context-oriented. They will be able to be adapted cleverly with a variety of temperatures, air flow, energy consumption and other conditions, climate, geology, etc. All these conditions are also given by planners of designing for the raw data to the building and structure so that the environment can be adapted in the event of any change

affecting the conditions of human life in order to achieve the comfort zone.

An intelligent building is the one which himself thinks and takes step with the measurements of needs to solve them. But is this the answer for the question of Louis Kahn who asked: what will be this building? Architects believe that the buildings speak with them and needs and their weaknesses are said. But if the buildings include artificial intelligence, they match themselves without consulting with the architect what the environment demands.

One of the researchers of Nano-technology and its impact on the human environment – Karzvi predicts that guest humans and buildings will be residents and owners in the next century. He believes that greater use of these artifacts to nature will increase in the future. Future buildings may not have any resemblance to the present century buildings. The traditional and past architecture are principally thrown away because limiting criteria will not have a role in future buildings. According to Karzvi, the time of construction is longer now that this will be reduced over time. It is clear that nanotechnology achievement in the future of humanity is much more important than the fate of other industries. Changes and developments in the field of architecture, in some countries, especially developed and developing countries – for example, in most buildings which are made in Dubai – show an important role of technology. Although the architects consider morality prior to the beauty and grace of their building, an especial emphasis on technology will never leave in the design office that this is not a responsibility for most their disabilities. However, if the purpose of architecture is just the creation of new forms, it seems that in not too distant future, architecture will not need to architect.

Immediate and reasonable degree and direct impact of nanotechnology and architecture are materials (physical productions) which generally give different applications to buildings. Such materials create new possibilities to complement and enhance the architectural object and thinking about a new form of life

Now the question arises that with the materials which have the ability to change and adapt material density, texture, shape, color, size and state of the environment, the fixed role of architecture as a physical nature which constitutes social relations, what will happen? If so, the time and place which is associated with the object of architecture, the history and architectural authenticity will not be fixed and by changing surroundings will change at any time and place.

Nano houses, future houses

The best scientists, engineers, architects and designers from Australia in a group work created a Nano house using the materials which are obtained through Nanotechnology. At University of Technology in Sydney the study of the relations, performances, materials and Nano project was discussed. Questions were also asked prior to design the building including: why a house? Because house was the first shelter for human and all easily understood the concept of house and in this regard, the impacts of Nano-technology architecture can be clearly felt.

And what is Nano house? Nano house is a combination of form, function, control and the main facilities of a shelter which do not waste energy and can annually save a million dollars in energy consumption and prevent from entering 12,500 tons of carbon dioxide to the atmosphere.

Nano house is composed of two layers. The first layer is called Nano-layer. This layer is the physical structure which the data is stored in it. The second layer is logical layer which analyzes the raw data and performs necessary changes for sustainability with the environment.

The goal is to design a new type of house that is so desirable level compatible with their environment.

Some types of Nano-technologies used in the house are as follows:

- Filtering solar radiation and windows reflecting heat from the sun;
- Self-cleaning glasses;
- Protective colors and skins and guiding radiations;
- Containers used at house, with features environmentally more in order to keep their content against infectious agents;
- Cold lighting systems using light sources for illumination during the day and at night;
- Water quality control systems that repel water pollution, and it is potable;
- The creation of anti-infective products to prevent the spread and transmission of diseases;
- The use of coatings which are not stunning against the most intense lights.

Image 2: Nano house in Australia in the site of Sydney Opera Hall

Image 3: An image of Nana house

Smart materials and structures

In the building depending on the location of smart materials, they can be used in three systems of facade, installations and structures (Addington & Schodeck, 2005), while the three mentioned system, the possibility of the selection in the facade system is given to the architect and the selection of other systems is not considered as architectural design process. Therefore, in this paper, the issue of smart windows is only discussed that this is from architect powers in the field of application of smart materials in the building and the facade system. It should be noted that we should focus on the reaction which we expect smart material in the selection of smart materials not on the shape and appearance because these materials have not modern appearance and their important feature is the special operation and their multi-functions.

Table2. An example of the replacement of conventional systems with smart materials in different building systems)(Addington & Schodeck .2005 . P.164

Construction System required	System specification or related materials	Smart materials
Control of the sun's rays inside	Transmission and absorption of visible light by covering materials	Panel of suspended particles Liquid crystal panels Photochromic Electrochromic
	The relative location of the coating materials	Louvre systems or panels Internal and external radiation sensors- Photovoltaic, Photoelectric Control/stimuli - Shape retention alloys, Electromagnetor Setricktiv
Control of heat transfer into the building	Thermal transfer of coating materials	Thermotropic, change of state materials
Control of internal heating	Heat capacity of internal materials	Change materials of styling
	Place of heat source	Thermoelectric
	Saving in the consumption of light energy	Fotolomicent Electromicent Emitting diodes

Table 3: An example of the replacement of conventional systems with smart materials in different building systems (Addington & Schodeck, 2005).

Energy	Peripheral energy storage and conversion into electrical energy	Photovoltaic, energy systems Micro and meso (thermoelectric)
Optimization of energy systems	Day light sensor Measuring light Occupancy sensor	Photovoltaic Photoelectric Piezoelectric
	Color of location and size of the source	Emitting light diodes (LED) Electrolomicent
Optimizing HVAC system	Temperature sensor Humidity sensor Chemical determination of carbon dioxide	Thermoelectric, Pyroelectric Biosensors, chemical sensors
	Place of source	Thermoelectric, change of state materials, Heat pipes
Control of structural systems	Monitoring stress and deformation Monitoring Control of stress and deformation Control and monitoring of earthquakes	Optical fiber, Piezoelectric Electroriological, magnetoriological Shape retention alloys

Materials and architecture

The relationship between architecture and materials has been fairly transparent and understandable from the industrial revolution up until now. The materials such as how to apply for their functional capacity and accessibility and the reasons for the appearance and quality of local customs and traditions, such as decorating were selected. Gems available on the site formed foundation and walls and valuable marbles often unveiled violent thin crust on glazed structures. Decisions about buildings and architecture determined the choice of materials. For example, we can use the material before the 19th century to understand the form and function. In addition, the materials were not classified and standardized in that time with certain criteria. Therefore, the building of the constructions and architects had to rely on foreign

understanding that they had the properties and methods of their implementation. In general, material science is obtained through experiments and experiences. Skilled builders are the ones that they obtained the knowledge and skills required for the use of existing materials often during a disastrous trial and error.

The role of the material suddenly changed with the beginning of the industrial revolution. Architects began exposure to engineered materials before their dependence on intuition and experience of the properties and performance of materials.

Types and characteristics of smart materials

Main features

1. The ability to change the property
2. The ability to exchange energy
3. Separate size or location (discrete)
4. Reversibility

These features can be used in the optimization of material properties to coordinate and optimize compliance with entry requirements unstable or certain behaviors in the environment to maintain stable conditions.

The table of the use of smart materials in architecture and case studies

This section will discuss on the explanation of again smart materials in architecture and determine essential ingredients in architectural applications. Then, the case studies are explained in order to understand more how to use smart materials to advance the needs of architecture and climate.

Applications of smart materials in architecture

Table 4: The use of smart materials in architecture and case samples, source: the author

The architecture need	Properties related material	The use of smart materials
Control of solar radiation passing through the wall of the building	Spectral passing or absorbing of the material of glazed building	Electrochromic Photochromic Liquid crystal displays panels suspended
	The relative location of the shell or chamber building	Perforated control systems External radiation systems (Photovoltaic) Daylight internal sensors (Photoelectric) Controllers (shape memory alloys)
Control of conductive heat passing from the wall of the building	thermal conductivity of glazed material	Thermotropic Phase-change material

Table 5: The use of smart materials in architecture and case samples, source: the author

Control of internal heat	The heat capacity of materials inside	Phase-change material
	The relative location of the heat source	Optical fiber systems Thermoelectric
	Energy conversion ratio W / lm	Fotolomicent Light-emitting diodes
Secondary energy storage systems	Turning environmental energy into electrical energy	Photovoltaic
Optimized lighting systems	Understanding daylight	Photovoltaic
	Illuminance measurements	Photovoltaic
	Sense of presence	
	The relative location of the heat source	Optical fiber Electrolomicent
Optimization of HVAC systems	Temperature sense	Piezoelectric
	Sense of humidity	Moisture meters
	Sense of presence	photoelectric

2. CONCLUSION

With the development of manufacturing industry in the world and creation of massive amounts of synthetic products, many byproducts were created in addition to main products. Nano-technology industry is without wasting energy, without byproducts and without residue and in fact, they are compatible with the environment. In conventional technology, the reactant is rarely converted 100% into products, but for example, the glass that has been reserved with Nano coating, do not pass infrared radiation. Smart materials are used more as a sensor due to the response to environmental stimuli. However, they can play an important role in all building systems, such as facade systems, structural systems, equipment and facilities. It should be noted that what has made possible the use of smart materials in different urban contexts, whether old or new tissues, etc., is to their ability in having non-modern appearance.

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