NATURAL NANO RESOURCES TO ENRICH SCIENTIFIC AND ECONOMICAL GLOBAL NEEDS

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Introduction: Energy efficiency is a cost-effective way to reduce energy consumption through existing and improved technologies and can play a significant role in reducing the threat of global climate change. By promoting the consumption of less energy, there will be less emission of greenhouse gases as the result of the burning of fossil fuels. Of all energy consumed worldwide, 28% is used by industry, 32% is used for transportation and 40% is used for buildings. Therefore, the development of energy saving practices and the use of energy from renewable sources constitute important measures.

The research in the nanomaterials area has increased through the years since the properties displayed by these can differ from those at a macroscale, due to their unique nature. Their electronic, optical, chemical and mechanic properties make them promising compounds in fields such as energy storage, sunscreens, paints and others [1]. Carbon nanotubes (CNT's) are an example of these remarkable materials. With a tube length much greater than their diameter, they can be considered one-dimensional structures, which influence their behaviour, making them excellent thermal and electrical conductors. However, CNT's are either obtained through energetically expensive techniques or through a large-scale and low-cost technique that has difficulties in obtaining reproducible well-defined materials [2]. Also, CNT's still raise concerns over their potential negative health effects, being compared to reactive fibers such as asbestos [3].

Food and agro industrial waste can be an advantageous resource for energetic utilization through thermal energy processes [4]. Every year, over 220 million tons of food waste are produced in Europe [5], making the implementation of methods for its reuse an environmentally friendly and economically viable solution. One of the main advantages of food and agro industrial waste over CNT's is their natural origin and biodegradability, allowing waste reuse and recycling. This kind of waste can be obtained from several sources such as cereals, fruits and sub-products of cephalopods fishing, specifically peels, hard shells, seeds, stones and ink sacs (ISC).

Results and discussion: From the experimental measurement of heat capacity it was found that the nut shell powder has higher values when compared to the hazelnut shell powder [6]. The samples of ISC studied have a heat capacity comparable or 1.5 times that of liquid water (4 $kJkg^{-1}K^{-1}$). All these results show the high potential of ISC as heat storage material [7].

Conclusions: There is a need in the world for more efficient insulation, produced by green procedures and having low cost, durability and ease of installation. That can be solved using these materials. As an insulation material, either alone or added to others, they have the capability of storing the same amount of energy in thinner layers of material, also allowing to decrease the number of panels used to protect the building.

Also, these materials can be used as pigments, being a natural alternative to the synthetic ones, involving simultaneously the principles of reuse and recycling. Therefore they can act as absorbers of solar radiation in paint coatings for solar collectors.

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