TECHNOLOGY ROUNDUP

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Editorial Board

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The Ultimate Choice for Insulation

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Forthcoming Tech Events

- First International Conference on Emerging Trends in Science and Technology (ICETST)
- 3RD International Multi disciplinary Research Conference
- International Conference on Innovative Computing Technology
- Frontiers of information Technology
- Tech Expo North America
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- 6th International Workshop on Integration of Solar Power into Power Systems
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Indigenous Technology

Power-Control Strategy for High Power Induction Melting

Induction melting is a type of heat-treatment process that works on the principle of electromagnetic induction. The induction heat treatments such as melting, tempering, forging and brazing etc. have evolved very rapidly in recent years. This research presents a power control scheme of a current source converter (CSC), which delivers a constant current to the load for induction melting applications. The proposed control scheme with SVPWM pattern regulates the power of a high Q- resonant load by controlling the DC current according to the defined target. The PI controller adjusts the manipulated variable by SVPWM in such a way that the error signal is reduced to a minimum value and a constant current is maintained uninterruptedly for the load. In order to validate this constant current requirement to the load, the output power analysis of the resonant inverter is also carried out. A power-control strategy with space vector pulse width modulation of current source converter has been presented for a parallel resonant inverter in induction melting applications. The system is modeled with proposed control strategy and simulated in MATLAB Simulink.

The analysis of the model has proved that the presented approach is an effective solution for the control of power in induction melting. The proposed control scheme is described through simulation in Matlab and the results show its effectiveness in induction melting applications.The constant current is maintained through this strategy and is desired for parallel resonant inverter to avoid the power fluctuation. Moreover, the output power of the resonant inverter is also confirmed by giving a constant current to the load.

Courtesy:

Pak. J. Engg. & Appl. Sci. Vol. 18 January, 2016 (11–20)
Muhammad Nawaz and Muhammad Asghar Saqib Department of Electrical Engineering, University of Engineering and Technology, Lahore (Pakistan)

Indigenous Technology

An Optimal Neural Technique for Breast Cancer Detection

Cancer describes the pathological condition of the uncontrolled growth of the affected body cells. The well-known cancer includes carcinoma (lung, breast and ovarian), Sarcoma (bones and cartilage), Lymphoma (lymph nodes) and Leukemia (blood cancer). According to World Health Organization (WHO), the rate of breast carcinoma is more than any other form of cancer in both advanced and developing countries. Breast cancer, although is considered to be the ailment of the established countries of the world, yet almost 50% of mammary carcinoma cases and 58% of fatalities occur in developing countries. Hence, early breast cancer detection and treatment is a major public health matter. Early identification of breast carcinoma could be beneficial for in time treatment of the disease. This research presents an efficient classification method for benign and malignant breast cancer. The proposed method employs an optimal feature classification employing artificial neural network.

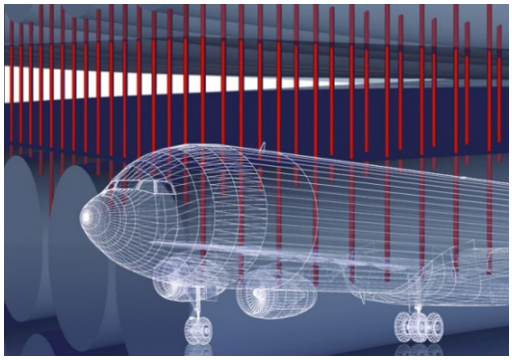
The proposed architecture has five input nodes, two hidden layers with eight neurons each and one output node. Five features (cluster thickness, uniformity of {cell size, cell shape}, marginal attachment and radius of circle enclosing the abnormality) are nominated as input features to the ANN to predict the benign or malignant breast carcinoma. The network is trained, tested and validated on data bases that comprises of a set of previously extracted features provided by Wisconsin and Essex Universities. For the established neural networks comparative analysis is performed to study the optimum parameters required for prime mass classification. The execution of suggested methodology is estimated using ROC curve. The accuracy rate of developed method is 93.1% or 0.93 with sensitivity of 0.99 and specificity of 0.83 according to the receiver operating characteristic (ROC). In future it would be fascinating to see, how the proposed method performs in noisy clinical images and it would be also interesting to observe the effect upon the accuracy of performance by increasing the number of cases/database.

Courtesy:

J. Engg. and Appl. Sci. 2016 Vol. 35 No(1) Pages 39-46
Kulsoom Iftikhar, Shahzad Anwar, Izhar Ul Haq, Muhammad Tahir Khan and Sayed Riaz Akbar
Institute of Mechatronics Engineering, University of Engineering & Technology, Peshawar, (Pakistan)

Carbon Nanotube "Stitches" to Strengthen Composites

The aerospace engineers from MIT have found a way to strengthen composites, helping make airplane frames lighter and more damage-resistant. The newest Airbus and Boeing passenger jets flying today are made primarily from advanced composite materials such as carbon fiber reinforced plastic extremely light, durable materials that reduce the overall weight of the plane by as much as 20 percent compared to aluminum-bodied planes. Such lightweight airframes translate directly to fuel savings, which is a major point in advanced composites favor. But composite materials are also surprisingly vulnerable: While aluminum can withstand relatively large impacts before cracking, the many layers in composites can break apart due to relatively small impacts, a drawback that is considered the material's Achilles' heel. Now MIT aerospace engineers have found a way to bond composite layers in such a way that the resulting material is substantially stronger and more resistant to damage than other advanced composites. The researchers fastened the layers of composite materials together using carbon nanotubes atom-thin rolls of carbon that, despite their microscopic stature, are incredibly strong. They embedded tiny "forests" of carbon nanotubes within a glue-like polymer matrix, and then pressed the matrix between layers of carbon fiber composites. The nanotubes, resembling tiny, vertically-aligned stitches, worked themselves within the crevices of each composite layer, serving as a scaffold to hold the layers together.



In experiments to test the material's strength the team found that as compared with existing composite materials, the stitched composites were 30 percent stronger, withstanding greater forces before breaking apart. Roberto Guzman, who led the work as an MIT postdoc in the Department of Aeronautics and Astronautics (AeroAstro), said that the improvement may lead to stronger, lighter airplane parts particularly those that require nails or bolts, which can crack conventional composites. The researchers' technique integrates a scaffold of carbon nanotubes within polymer glue. They first grew a forest of vertically-aligned carbon nanotubes and transferred it onto a sticky, uncured composite layer. Then they repeated the process to generate a stack of 16 composite plies, with carbon nanotubes glued between each layer. Carbon nanotubes are about 10 nanometers in diameter nearly a million times smaller than the carbon fibers. Researchers are able to put these nanotubes in without disturbing the larger carbon fibers, and that's what maintains the composite's strength. What helps in enhancing strength is that carbon nanotubes 1,000 times more surface area than carbon fibers, which lets them bond better with the polymer matrix. The strength enhancements suggest this material will be more resistant to any type of damaging events or features. Since the majority of the newest planes are more than 50 percent composite by weight, improving these state-of-the art composites has very positive implications for aircraft structural performance. With their intrinsically light weight, there is nothing on the horizon that can compete with composite materials to reduce pollution for commercial and military aircraft. According to Tsai, who did not contribute to the study but he says the aerospace industry has refrained from wider use of these materials, primarily because of a lack of confidence in [the materials'] damage tolerance. The work by Professor Wardle lead researcher of the team addresses direct how damage tolerance can be improved, and how higher utilization of the intrinsically unmatched performance of composite materials can be realized.

www.scitechdaily.com/news/technology

US offshore Wind Farm can Power an Entire Island

The turbines at the first offshore wind farm in the US were installed last week, and their blades are set to start generating power by the end of the year. The Block Island Wind Farm, developed by Deepwater Wind in

Providence, Rhode Island, will be able to produce enough power for 17,000 homes up to 30 megawatts. That is much less than many of the offshore wind farms in the UK and Europe generate, some of which contain more than 100 turbines and together have the capacity for 11,000 megawatts of electricity. The US already gets about 5 per cent of the electrical power it produces from inland wind energy. According to Deepwater Wind CEO Jeffrey Grybowski wind tends to be stronger and more stable over the ocean and is also generally strongest during the late afternoon and early evening, when electricity demand peaks. This makes offshore areas an attractive location for future development.

For large population centres here in the north-east, there is a need to find a way to generate clean energy locally. Wind could be the answer; it is clearly the biggest clean energy resource in the north-east.The five-turbine Block Island Wind Farm sits about 5 kilometres off the coast of Rhode Island's Block Island. The farm will supply electricity to the island's 1000 or so permanent residents who currently rely on diesel-generated power as well as to the mainland grid. The offshore wind farm is a first for the country, but its turbines won't be lonely for long. There are 21 offshore wind projects in development in the US, collectively expected to produce more than 15,000 megawatts of power once they are completed.The Block Island project sets the stage for future offshore wind installations. Christopher Kearns, the chief of programme development at the Rhode Island Office of Energy Resources told that this is a win for Rhode Island," They are certainly excited to be the first in the nation.

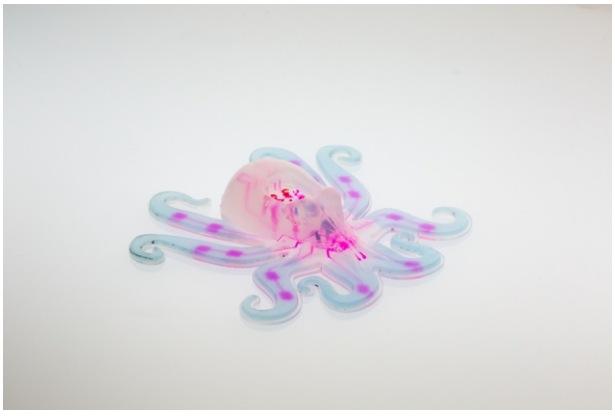
By Emily Benson

www.newscientist.com

First Autonomous Soft Robot: Octobot

A team of Harvard University researchers with expertise in 3D printing, mechanical engineering, and microfluidics has demonstrated the first autonomous, untethered, entirely soft robot. This small, 3D-printed robot the octobot could pave the way for a new generation of completely soft, autonomous machines. Soft robotics could revolutionize how humans interact with machines. But researchers have struggled to build entirely compliant robots. Electric power and control systems such as batteries and circuit boards are rigid and until now soft-bodied robots have been either tethered to an off-board system or rigged with hard components.

One long-standing vision for the field of soft robotics has been to create robots that are entirely soft, but the struggle has always been in replacing rigid components like batteries and electronic controls with analogous soft



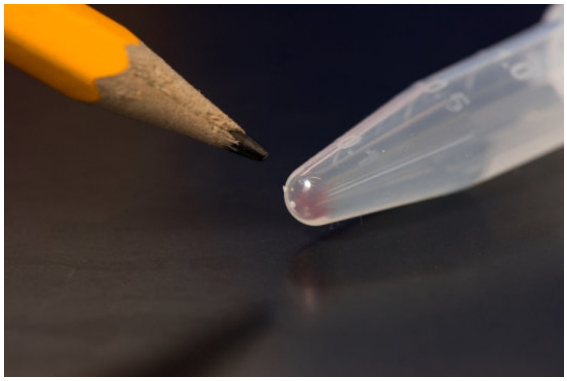
systems and then putting it all together, this research demonstrates that we can easily manufacture the key components of a simple, entirely soft robot, which lays the foundation for more complex designs. Through hybrid assembly approach, researchers were able to 3D print each of the functional components required within the soft robot body, including the fuel storage, power and actuation, in a rapid manner. The octobot is a simple embodiment designed to demonstrate integrated design and additive fabrication strategy for embedding autonomous functionality. Octopuses have long been a source of inspiration in soft robotics. These curious creatures can perform incredible feats of strength and dexterity with no internal skeleton. Harvard's octobot is

pneumatic-based, i.e., it is powered by gas under pressure. A reaction inside the bot transforms a small amount of liquid fuel (hydrogen peroxide) into a large amount of gas, which flows into the octobot's arms and inflates them like a balloon. Fuel sources for soft robots have always relied on some type of rigid components. The wonderful thing about hydrogen peroxide is that a simple reaction between the chemical and a catalyst in this case platinum allows to replace rigid power sources. To control the reaction, the team used a microfluidic logic circuit based on pioneering work by co-author and chemist George Whitesides, the Woodford L. and Ann A. Flowers University Professor and core faculty member of the Wyss. The circuit, a soft analog of a simple electronic oscillator, controls when hydrogen peroxide decomposes to gas in the octobot. The entire system is simple to fabricate, by combining three fabrication methods soft lithography, molding and 3D printing. These devices can quickly be manufactured. The simplicity of the assembly process paves the way for more complex designs. Next, the Harvard team hopes to design an octobot that can crawl, swim and interact with its environment.

www.dailymail.co.uk

DNA Data Storage

Over the past few decades, it has become apparent that Moore's Law has started to come apart. The 1965 observation, named after Gordon E. Moore, stated that the number of components on a chip seemed to double every year, but we are reaching the limit of silicon's storage capabilities. To keep pushing the boundaries of computing technology, we will need to rethink the basic components of computers themselves. And the field of DNA storage could offer a solution to a problem growing ever more apparent in our digital world: Where do we store billions of gigabytes of data that make up the Internet? A large part of building better computers is about finding better materials to build computers with, So, silicon happens to be a fantastic material, but it is reaching a point where it is unclear that we can continue pushing forward with silicon. It is fascinating that biology has evolved many molecules that are useful for building better computers in the future. Current archival facilities, such as the data storage center Facebook recently built in Oregon, occupy entire warehouses and can store about an exabyte 1 billion gigabytes of data at a maximum. That's just a fraction of the entire internet, which is forecast to reach 16 zettabytes, or 16,000 exabytes, by 2017. By encoding information using DNA, the blueprint for life on Earth, researchers say that they could take all of that information and fit it in your living room. By taking bits of information and translating them from the 1s and 0s on a computer chip into the four letters of DNA, scientists can create strands of DNA that encode for anything you like, from a Taylor Swift song to the Library of Congress.



To accomplish this, researchers build an index that links the four nucleotides that make up DNA (A,T,C and G) to the strings of 1s and 0s we already use on our computers. DNA synthesizer creates short strands of DNA that each hold a part of a file's code. Once all of the information has been converted to DNA, the information can be stored and retrieved by a DNA sequencer that reads combinations of nucleotides. Ceze is part of a team of researchers at the University of Washington that has developed a new method of encoding and reading information stored in synthetic DNA. They looked to a widely used audio compression tool called the Huffman code, which is a way to express strings of binary code in a shorter way. He says that their method allows for even greater storage capacity by reducing redundancies the process of making multiple identical strands to account for errors and allows individual pieces of the data to be read without sequencing all of the DNA stored, something that had not previously been done. The method includes unique “primers” in individual strands of DNA that can be targeted during the sequencing process to highlight a particular strand. They say that this improves functionality

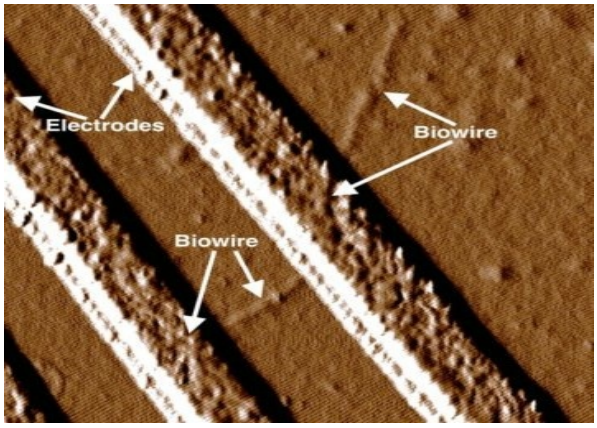
of their system, eliminating the need to sequence the entire database just to read a single strand. As a proof-of-concept, the team encoded the information for several image files in synthetic DNA and successfully sequenced the strands to redraw the pictures. While they only encoded several megabytes of information, Ceze told that the process could be scaled up to hold much larger databases. If we compare flash to DNA in terms of density, or the number of bits in a certain volume, DNA will be at least a billion times denser. Ceze emphasizes that synthesizing DNA to store data is not related to genetic engineering. Instead of attempting to put together the right strands of DNA to create an organism, their method is entirely synthetic.

Storing data in strand of DNA has one significant drawback: it is slow. Unlike computer chips, which communicate at nearly the speed of light using electrons, DNA data storage relies on physically moving molecules around. For this reason, researchers should not expect to see DNA hard drives at your local computer store in the near future. Instead, he envisions using DNA data storage to preserve massive data archives, such as those used by Facebook and cloud storage services, where speed is not as crucial. The technology also remains expensive. But, even compared to five years ago, prices have dropped precipitously.

www.blogs.discovermagazine.com

Soil Bacteria work as Electrical Wires

Scientists sponsored by the Office of Naval Research (ONR) have genetically modified common soil bacteria to create electrical wires that not only conduct electricity, but are thousands of times thinner than a human hair. As electronic devices increasingly touch all facets of people's lives, there is growing appetite for technology that is smaller, faster and more mobile and powerful than ever before. Thanks to advances in nanotechnology industry can manufacture materials only billionths of a meter in thickness. The researchers led by microbiologist Dr. Derek Lovley at the University of Massachusetts Amherst told that their engineered wires can be produced using renewable "green" energy resources like solar energy, carbon dioxide or plant waste; are made of non-toxic, natural proteins; and avoid harsh chemical processes typically used to create nanoelectronic materials. Research could lead to the development of new electronic materials to meet the increasing demand for smaller, more powerful computing devices. Being able to produce extremely thin wires with sustainable materials has enormous potential application as components of electronic devices such as sensors, transistors and capacitors. The centerpiece of Lovley's work is Geobacter, a bacteria that produces microbial nanowires hair-like protein filaments protruding from the organism enabling it to make electrical connections with the iron oxides that support its growth in the ground.



Although Geobacter naturally carries enough electricity for its own survival, the current is too weak for human use, but is enough to be measured with electrodes. Dr. Lovley's team tweaked the bacteria's genetic makeup to replace two amino acids naturally present in the wires with tryptophan which is blamed (incorrectly, some say) for the sleepiness that results from too much Thanksgiving turkey. Food allegations aside, tryptophan actually is very good at transporting electrons in the nanoscale. As they learned more about how the microbial nanowires worked, they realized it might be possible to improve on nature's design; they rearranged the amino acids to produce a synthetic nanowire that might be more conductive. They hoped that Geobacter might still form nanowires and double their conductivity.

The results surpassed the team's expectations as the synthetic, tryptophan-infused nanowires were 2,000 times more conductive than their natural counterparts. And they were more durable and much smaller, with a diameter of 1.5 nanometers (over 60,000 times thinner than a human hair), thousands of nanowires could possibly be stored in the tiniest spaces, having potential applications as electronic and computing devices continue to shrink in size they might be installed in medical sensors, where their sensitivity to pH changes can monitor heart rate or kidney function.

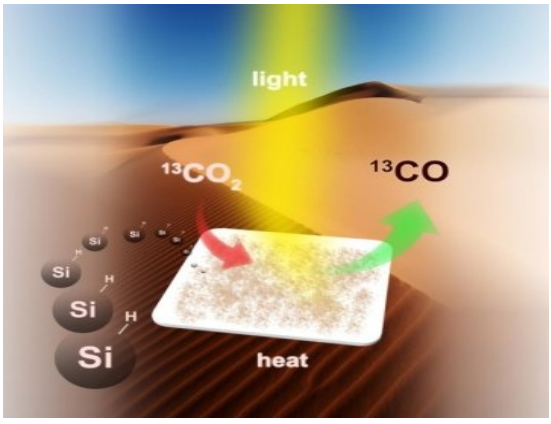
From a military perspective, the nanowires could feed electrical currents to specially engineered microbes to create butanol, an alternative fuel. This would be particularly useful in remote locations like Afghanistan, where fuel convoys are often attacked and it costs hundreds of dollars per gallon to ship fuel to warfighters. Nanowires also may play a crucial role in powering highly sensitive microbes (which could be placed on a silicon chip and attached to unmanned vehicles) that could sense the presence of pollutants, toxic chemicals or explosives. This research is part of ONR's efforts in synthetic biology, which creates or re-engineers microbes or other organisms to perform specific tasks.

www.onr.navy.mil

Converting Gaseous Carbon Dioxide to Fuel

A team of scientists from the University of Toronto have found a way to convert all emissions into energy-rich fuel in a carbon-neutral cycle that uses a very abundant natural resource: silicon. Silicon, readily available in sand, is the seventh most-abundant element in the universe and the second most-abundant element in the earth's crust. The idea of converting carbon dioxide emissions to energy is not new: there has been a global race to discover a material that can efficiently convert sunlight, carbon dioxide and water or hydrogen to fuel for decades. However, the chemical stability of carbon dioxide has made it difficult to find a practical solution.

According to Geoffrey Ozin, a chemistry professor in U of T's Faculty of Arts & Science, the Canada Research Chair in Materials Chemistry and lead of U of T's Solar Fuels Research Cluster, a chemistry solution to climate change requires a material that is a highly active and selective catalyst to enable the conversion of carbon dioxide to fuel. It also needs to be made of elements that are low cost, non-toxic and readily available. Ozin and colleagues report silicon nanocrystals that meet all the criteria. The hydride-terminated silicon nanocrystals nanostructured hydrides for short have an average diameter of 3.5 nanometres and feature a surface area and optical absorption strength sufficient to efficiently harvest the near-infrared, visible and ultraviolet wavelengths of light from the sun together with a powerful chemical-reducing agent on the surface that efficiently and selectively converts gaseous carbon dioxide to gaseous carbon monoxide.The potential result is energy without harmful emissions. Ozin told that making use of the reducing power of nanostructured hydrides is a conceptually distinct and commercially interesting strategy for making fuels directly from sunlight. The U of T Solar Fuels Research Cluster is working to find ways and means to increase the activity, enhance the scale, and boost the rate of production. Their goal is a laboratory demonstration unit and, if successful, a pilot solar refinery.



www.utoronto.ca

Forthcoming Tech Events

National

First International Conference on Emerging Trends in Science and Technology (ICETST)
6-10 September, 2016
Pearl Continental Hotel, Rawalpindi
www.fjwu.edu.pk

3RD International Multi disciplinary Research Conference
27-28 September, 2016
Peshawar , Khyber Pakhtunkhwa
www.suit.edu.pk

International Conference on Innovative Computing Technology
22-24, November 2016
Bahawalpur, Pakistan
www.intech-bahawalpur

Frontiers of information Technology
22-24, November 2016
COMSATS Institute of Information Technology, Pakistan

International Events

Tech Expo North America
20-21, October 2016
Santa Clara, United States
www.iotevents.org

Key Energy 2016
8-11, November 2016
Rimini, Italy
www.en.keyenergy.it

6th International Workshop on Integration of Solar Power into Power Systems
14-15, November
Vienna, Austria
www.solarintegrationworkshop.org

Event Tech
14-16 November
The Paris Las Vegas
www.eventtech.eventmarketer.com

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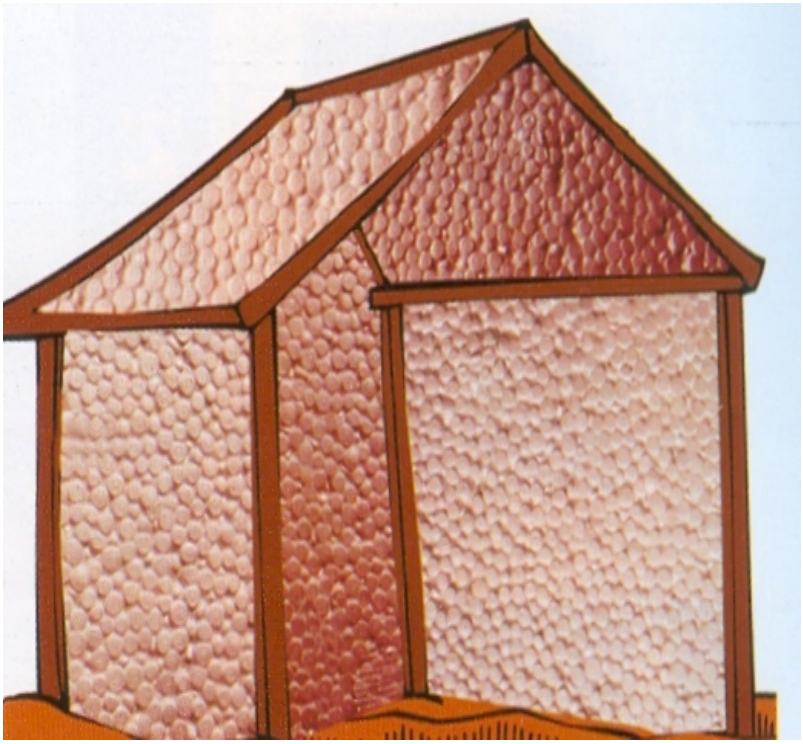

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