



## - Airloy And Pyrogel-

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### **Abstract:-**

Aerogels are ultra super insulating materials , with extremely low density .There are many types of aerogels have been created, including carbon – based, silica – based, and caly – based airloy and pyrogel. In this project, we used airloy as an electronic board and compare it with other materials used to the same purpose, we find that airloy bear high temperature compared to other materials .We also use pyrogel as a good replacement material to the fiber class materials that has been use for building "mina" tents .

*Key words – Aerogel, Airloy, Pyrogel, Insulators.*

### **Introduction:-**

In The Stages Of Development Of Our Civilization We Are Faced With Problems That May Threaten Our Lives And Up To The Stage Of Risk Factors Such As Shocks Of Electricity That Lead To Death . And High Temperatures That Cause Bouts Of Conflict And Death In The Late Stages . Also, Noises On Our Enviroment The Noise Of Factories And Equipment Which Increases The Intensity Of Tension And Disorder Individuals In The Rise Following In Offence Rates In The Community. To Overcome These Problems, The Researchers And Developers Found First And Foremost Solutions Which Are The Insulators That

Used To Protect Us Of These Serious Effects, Different Kind Or Insulators Has Been Used In Construction And Electrical Wiring Cover And In The Fabric Of Clothing, And Even It Is Being Used In Many Different Industries. Aerogel Is One Of The Most Promising Insulators , Due To Its Unique Properties That Give It The Possibility To Improve Technologies In A Diversity Of Fields. Aerogel It Is One Of The Best Solids That Has Nanoscale Pores , It Has A Very Low Density Up To  $3 \text{ Km}/m^3$  And Described As Frozen Smoke. Aerogel Has Many Different Kinds Vary According To Their Physical Properties And The Area Of Uses<sup>[1]</sup>. According To

Their Applications, Aerogel Could Be Classified To Three Different Categories:

1- In The Heat Insulation: Aerogel Has A Very Low Thermal Conductivity Therefore, It Is Good In Thermal Insulator.

Figure1: Shows The Heat Flux For Some Materials Including Silica Aerogel . [1][6]

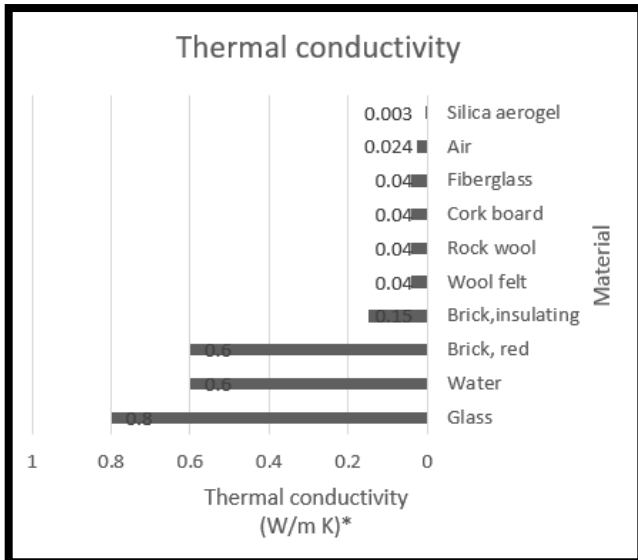


Figure1: Shows The Heat Flux For Some Materials Including Silica Aerogel .

Many Types Of Aerogel Are Used In Thermal Insulation Such As Airloy , Thermal Wrap , Enova Aerogel , Silica Aerogel And Pyrogel[1].

2- In The Sound Insulation : Aerogel Products Are Very Good Sound Insulator , since they are porous materials absorb the sound significantly , velocity sound inside it of up to 0.1 m / s.

Figure2: shows velocity sound in aerogel granules compared to glass wool [1][3]

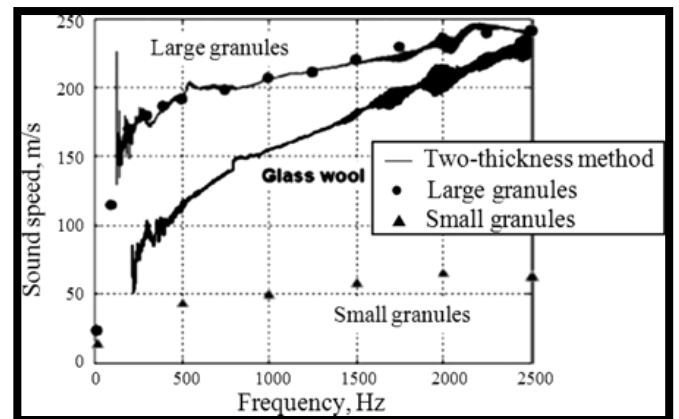


Figure2: shows velocity sound in aerogel granules compared to glass wool

Many types of aerogel are used in sound insulation such as airloy ,thermal wrap , silica aerogel and pyrogel

3- In electronics products : One kind of aerogel called carbon aerogel are used in industry supercapacitors it is capacity is up to thousands of farads and constant isolated up to less than 1.1. [2][4]

Figure3: shows aerogel capacitor

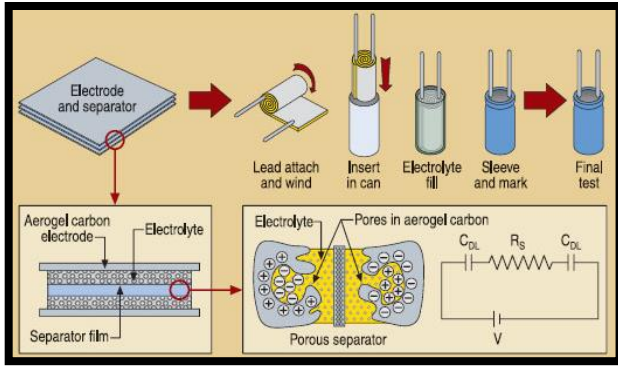


Figure3: shows aerogel capacitor

Many types of aerogel are used in electronics products such as RF Aerogel and Carbon.

The project we use two kinds of aerogel products in different applications airloy and pyrogel. We use airloy as an electronic board and compare it with plastic and wood which how be you used in electronic board airloy is a very good material in making an electronic board since it bears very high temperature compare it to the usually used material. Also we use pyrogel to making hajj tents at “mina” is nonflammable material and excellent insulator of heat and sound

### Airloy as an insulating board in electronic circuit :-

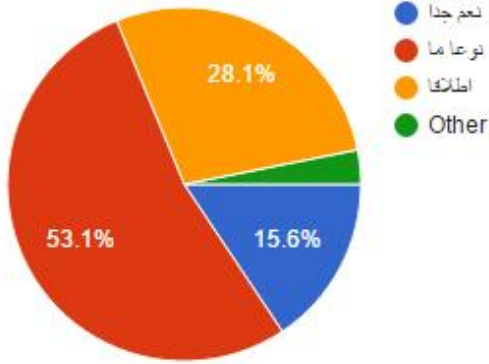
The electronic circuit board is a substrate that usually made of a dielectric materials .The substrate is characterized by their thermomechanical and electrical

properties . Airloy is one of aerogel products that has unique properties such as , it is strong Flexible , easy to use , good insulator of electricity , good insulator of heat and sound , nonflammable and The very light weight density ranging from 0.01 - 0.9 g / cc . We use airloy as a substrate board to make a simple electronic circuit , and compare it with other substrates materials such as wood and plastic . We find that airloy substrate bears higher temperatures than wood and plastic substrates does . Airloy bear high temperatures up to 600 F .<sup>[1][7]</sup>

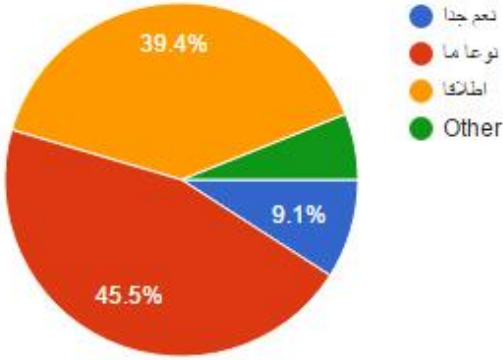
### The mina improved tent material:

Improving tents in mina is one of the most important issue which has been carried out by kingdom of saudi arabia for the ease and well-being of pilgrims. The tents at mina are constructed of fiberglass coated with teflon in order to make them high resistance of fire. Although, this material exudes poisonous at high temperature<sup>[8]</sup>. In addition, the fiberglass material does not insulate sound and heat surrounding the tent<sup>[1]</sup>. This according to the questionnaire that we have made among 33 pilgrims that have used mina’s tents, as we shown in figure 4

هل ترا أن خيام منى تُوفر الهدوء للحاج ؟



في ارتفاع درجة حرارة الجو هل الخيام تحتفظ ببرودة التكييف ؟



هل تؤيد فكرة تصنيع خيام منى من مادة تعزل الصوت والحرارة وغير قابلة للاشتعال ؟

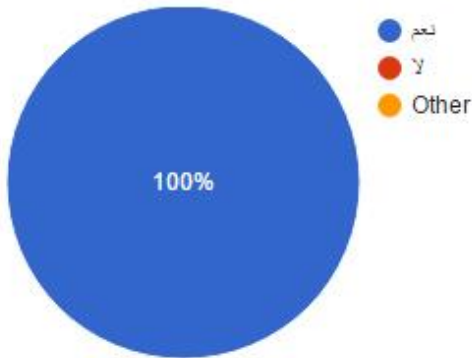


figure4 : the questionnaire that we have made among 33 pilgrims that have used mina's tents

Replacing inoculation leather fiberglass with pyrogel, would overcome these problem. Pyrogel is a class of aerogel products that characterizes by it flexibility, non-flammable property, sound insulating, low-cost, and thermal insulating. Table1 compares the Inoculation leather by fiberglass and pyrogel

	Leather By Fiberglass	Pyrogel
Costs	150,000rs for Tent 8 * 8	30,000rs for Tent 8 * 8
Heat insulation	Does not	Does it
Sound insulation	Does not	Does it
Flammable	NonFlammable	NonFlammable

Table1 It compares the Inoculation leather by fiberglass and pyrogel

### Conclusion:-

The purpose of our study is to use aerogel and airloy ass we now it is a good quality ,solid material and perfect insulator . So we can utilization in our area we use airloy x103 , perogel blanket ,fire welding 1300c

and electronic circuit. Airloy electronic circuit worked well the sample available our airloy category x103 do not bear the high temperatures for a long time but could use the airloy category x114. Tents made of perogel was better than what we expected they advantages of This tents It ls availability for guests of god full comfort by less costly , Disadvantages of the perogel It ls cut by sharp tools.

### **Acknowledgment:-**

To all our mothers, especially to Jumana mother , Dr. Amina Al-Ahmadi - Umm Al Qura University , Engineer: Wesam Munshi - smart methods , Engineer: Mohamed Mansour Aldeih - holy makkah municipality and Umm Al Qura University

### **References:-**

1. <http://www.aerogel.org/>
2. Steiner III, Stephen A. "Layered aerogel composites, related aerogel materials, and methods of manufacture." U.S. Patent Application No. 14/214,887.
3. Hrubesh, Lawrence W. "Aerogel applications."

- Journal of Non-Crystalline Solids* 225 (1998): 335-342.
4. Riffat, Saffa B., and Guoquan Qiu. "A review of state-of-the-art aerogel applications in buildings." *International Journal of Low-Carbon Technologies* 8.1 (2013): 1-6.
  5. [osti.gov/scitech/servlets/purl/151781](http://osti.gov/scitech/servlets/purl/151781)
  6. <http://hyperphysics.phy-astr.gsu.edu/hbase/tables/thrcn.html>
  7. <http://www.portcity.edu.bd/ELibrary/EEE/fundamentalsofelectrircircuits.pdf>
  8. [http://www.kapl-hajj.org/mina\\_tents\\_development\\_.php](http://www.kapl-hajj.org/mina_tents_development_.php)