Tortuous Path

As with all extruded material, Insultex utilizes a gas injection process to create a structure of randomized gas-filled spheres throughout the material. However, unlike any other extruded material, the injection gas used to create the gas-filled spheres within Insultex is completely expunged from the material during the curing process, thereby creating a unique extruded material. The material has been scientifically proven to be comprised of a countless number of evacuated cells without even a trace amount of the injection gas used in the creation of the material.

There is a class of insulation materials known as mass insulation. The measured insulation magnitude of mass insulation materials is referred to as an R-value. The R-value is dependent upon the thermal conductivity [W/(m-^{O}K)] of the material and the path travel distance of the heat. It is for this reason that the thickness of mass insulation is commonly treated as a linear function with respect to the material's R-value. The reason for this acceptance is due to the fact that very frequently heat traverses through mass insulation as a linear function of its thickness. Hence, R-value is a linear function of a material's thickness.

The material structure description of Insultex reveals that a more accurate classification for this insulation material is "absence of mass" insulation, which is due to the fact that its structure consists of a countless number of evacuated cells that are devoid of mass, namely elemental and molecular gases.

The representation below, Figure 1, is an approximate expanded view of the Insultex material and depicts the randomized spherical structure of the evacuated cells. Due to the cells' evacuated state, their thermal conductivity approaches the value of a vacuum, which is zero. The result is that each evacuated cell acts as a thermophysical barrier to the conduction of heat through the material. This interrupts the natural directional flow of heat, and introduces a three-dimensional non-linear tortuous path in which the heat traverses through the material, which is illustrated in Figure 2. It is important to realize that the tortuous path shown in Figure 2 only illustrates a two-dimensional tortuous path when, in fact, it is actually a significantly more complex three-dimensional tortuous path. It is key to understand that the R-value for "absence of mass" insulation material is greatly enhanced by the length of the tortuous path traversed by the heat (thermal energy).

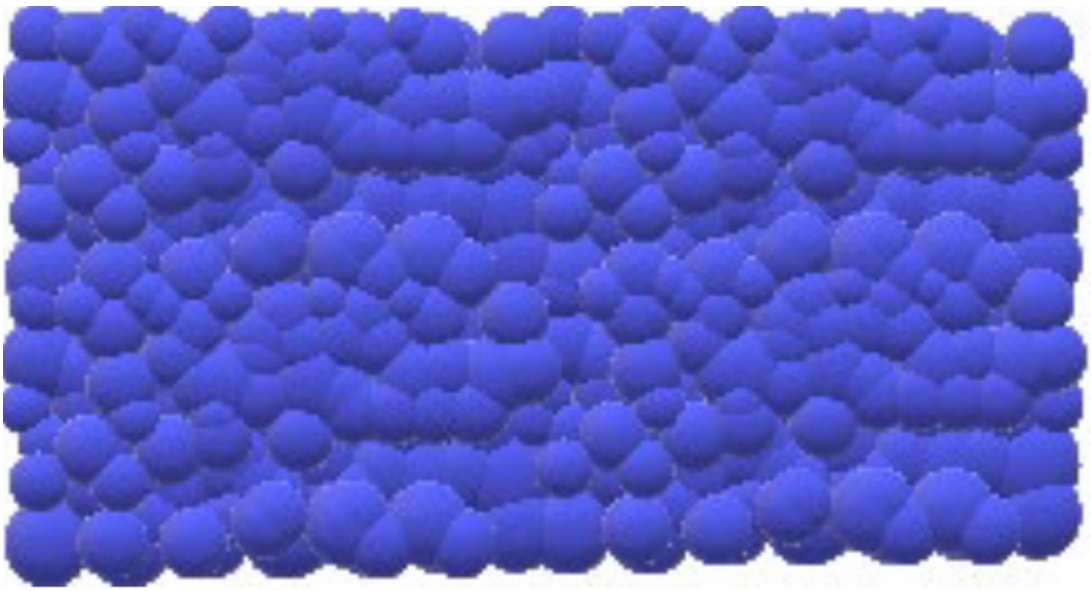

Figure 1: Approximate expanded view of the Insultex material

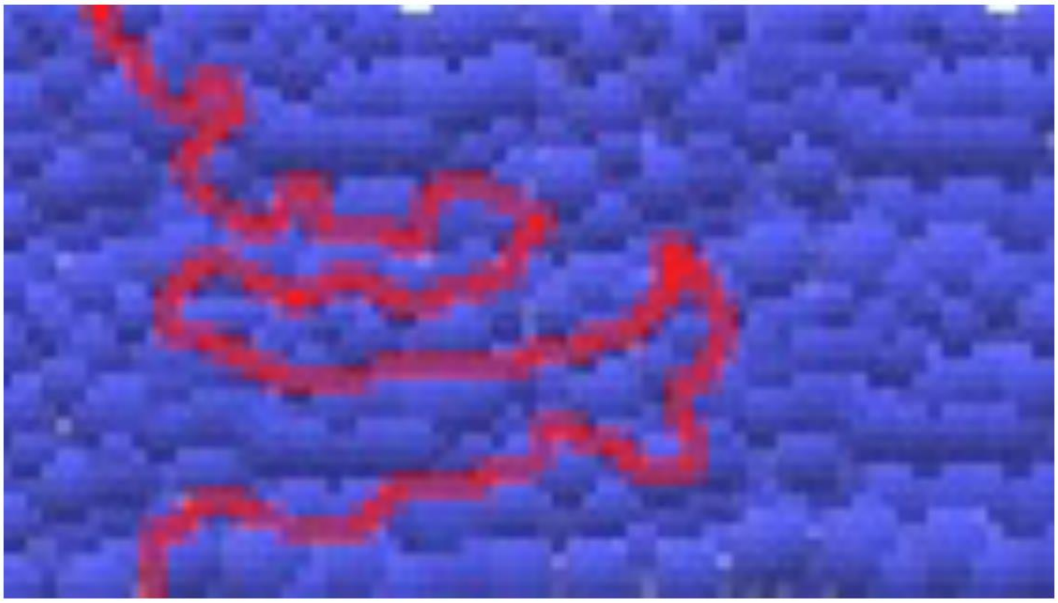

Figure 2: Depiction of a three-dimensional non-linear tortuous path in which the heat traverses through the Insultex material

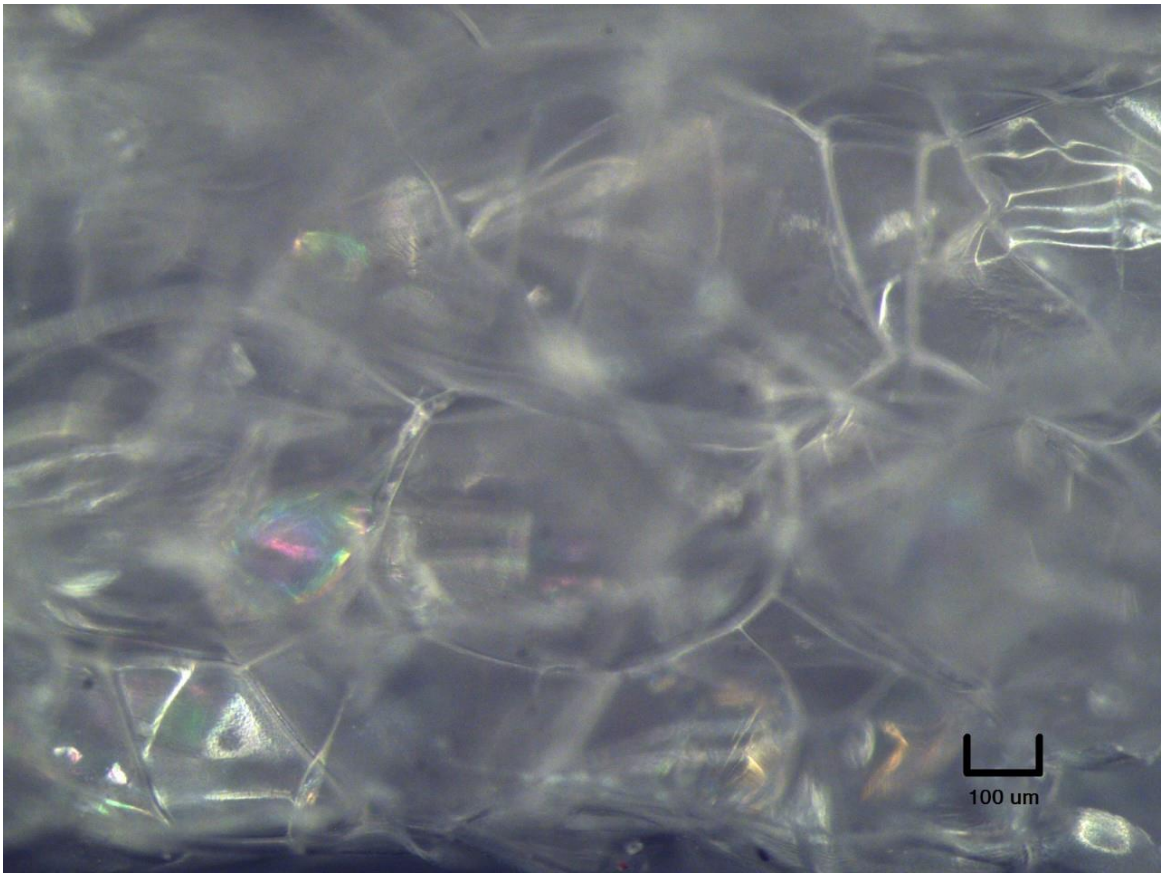

Figure 3: Scanning Electron Micrograph of Insultex. The magnification is 54X. The micrograph illustrates the cellular structure of Insultex.

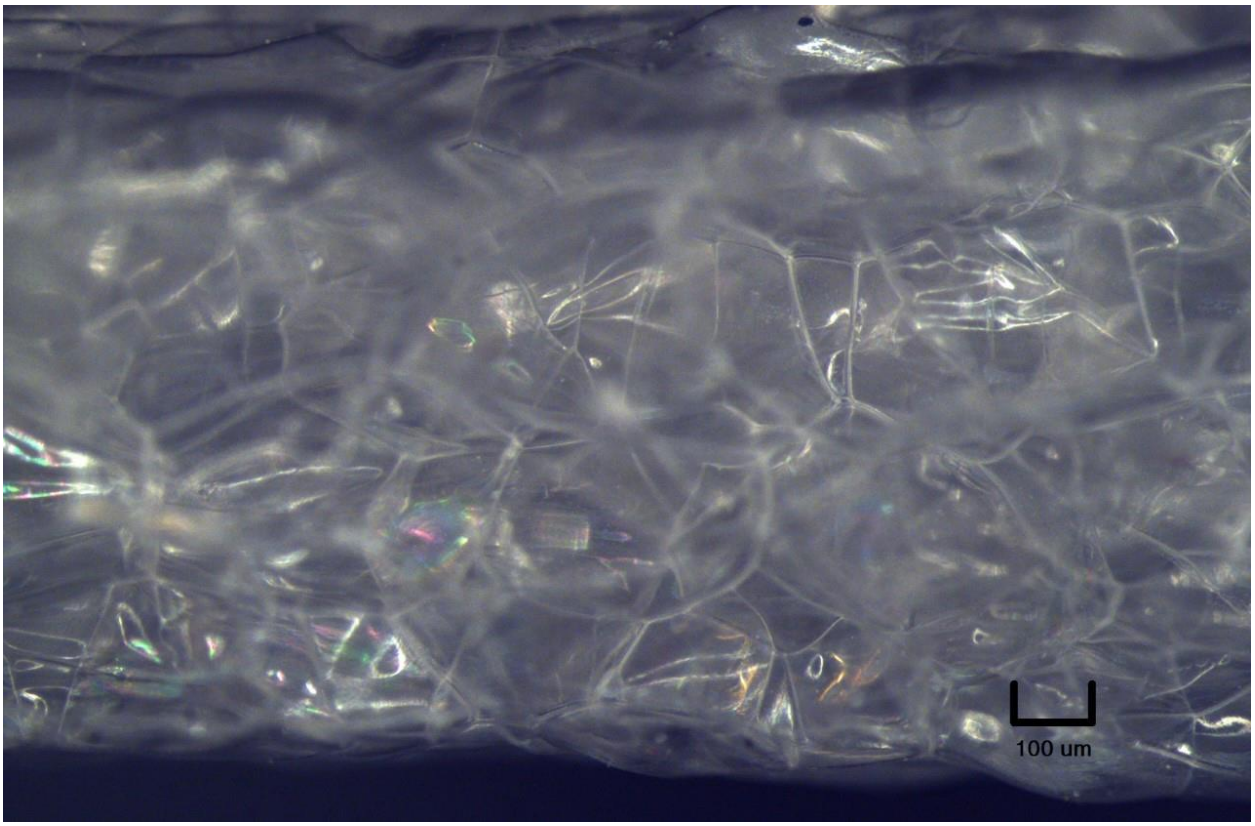

Figure 4: Scanning Electron Micrograph of the cross-section of Insultex. The magnification is 27X. The micrograph illustrates the cellular structure of Insultex.