

AEROGEL INSULATION MATERIAL BASED EXTREME COLD WEATHER CLOTHING

The cold weather clothing presently used by the Armed Forces and developed by DEBEL caters to subzero climatic conditions up to -20 to -30 deg C. Armed Forces in the recent times have projected requirements of an effective Cold weather clothing up to -50 deg C. The existing cold weather ensemble based on multilayer clothing does not cater to the requirements projected above. Keeping the above present and futuristic requirements in view, DEBEL in association with TUL, Czech Republic embarked into the development of Aerogel insulation material to address and meet the critical requirements of cold weather clothing and has established a technology of providing an effective solution to the Extreme Cold weather and Glacier region.

Aerogel material characterised by a combination of high porosity and extremely small pores provides lowest bulk density of any known material, highest specific surface area of any monolithic (non-powder) material (up to 3200 m²/g) and very low thermal conductivity and hence offer light weight solutions compared to contemporary insulating materials which restrict body movement thereby hindering the operational movements of the pilots.

In order to meet extreme cold weather clothing, Aerogel (Amorphous silica was incorporated in the nano solution and nano fibre was spun - needleless electro-spinning with nanofibre size in the range of 100 to 200 nm) and reinforced with non-woven structures. The technology associated in the manufacture of non-woven is based on STRUTO/ROTIS/Spun bonding/spun laced techniques.

This state of the art technology will also give an opportunity to incorporate nano fibre structure wherein Aerogel can be incorporated in a sandwich pattern. The above technical textile structure is converted into garment finds applications in sub-zero climatic conditions and can be effectively used in Paratrooper Jump suits and Cold weather Jackets. The technical edge that the aerogel based nano fibres and nonwovens offer is also expected to find applications in the area of Space suits.

