ABSTRACT SUBMISSION

-For invited speaker only

Applications and Measurements Methods of Radiant Heat Exchange of the Human Body - Opportunities and limitations of newly engineered fibers, fabric and finishes

Emiel Den Hartog[1]

[1]*Wilson College of Textiles, North Carolina State University, 1020 Main Campus Drive, Campus Box 3801, Raleigh, NC, 27606, USA*

[*]Presenter's email: eadenhar@ncsu.edu

ABSTRACT (NO MORE THAN 500 WORDS:)

Following the fundamentals of heat transfer human body heat loss through clothing is through conduction, convection, radiation and evaporation. Of these 4 the radiative heat loss has been the least studied. Depending on environment and clothing radiative heat loss is a significant but usually not dominant factor in heat loss. Notable exceptions are in the presence of hot surfaces or objects or in the full sun. Recently, novel fiber and finishing technologies are aimed at influencing the radiant heat exchange between body, clothing and environment. Ceramic fibers and ceramic particles added to fibers are aimed at increasing emission of radiant hat from the fabrics and increasing absorption of radiant heat from the body. Recent literature and measurements have demonstrated that some of these materials indeed increase fabric emissivity. Unfortunately, in some cases the applications of technologies are based on misconceptions of radiant heat exchange. Enhanced radiant heat absorption will either enhance or reduce radiant heat loss from the body depending on environmental conditions and existing temperature gradients.

In this lecture I will go through the basic principles of radiant hat exchange, demonstrate the driving equations and their consequences and link this theory to fabric measurements. Furthermore, an overview of previous literature will be provided, demonstrating these principles at work in realistic test conditions. Then this body of knowledge will be used to study how radiant heat exchange may be affected by novel fibers or finishes, thus providing targeted benefits to the human body, but also provide caution to the effects that can be achieved realistically. This extensive overview should provide clear guidelines on how radiant absorptive and reflective technologies could be used in principle, and how these technologies should be evaluated to demonstrate their effectiveness.