



MECHANICAL ENGINEERING SEMINAR

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Thermal Bonding Patterns Affecting Nonwoven Properties: Experiments and Modeling

Wenshuo Zhang, Ph.D.

Postdoctoral Associate

Beijing Key Laboratory of Green Chemical Reaction Engineering and Technology
Tsinghua University. Email: wenshuozhang1990@gmail.com

Hosted by Emer. Professor Michael Shapiro <https://technion.zoom.us/j/96608417752>

Nonwoven products are currently widely utilized in protective clothing, medicinal and surgical applications, construction and roofing. Enhancing the performance of nonwoven textiles under a variety of conditions and situations is critical. Thermal bonding is an effective method for enhancing the mechanical properties of nonwovens. This technique is carried out by heating a web of polymer fibers to the melting or softening temperature under significant pressure at bonding locations and then cooling it in the bonded state. The qualities of thermal bonding products are highly reliant on the methodology used to supply thermal energy. Production parameters, such as bonding temperature and pressure, have a significant effect on the mechanical properties of certain polymer nonwovens. However, many key factors that influence the performance of thermally bonded nonwovens remain to be researched, and some patterns and parameters have been empirically corroborated and selected to enhance nonwoven production efficiencies and product quality. This presentation will discuss how thermal bonding patterns affect the properties of nonwoven fabrics and the ways to optimize fiber manufacturing processes. Various thermal bonding factors, including bonding area and location, as well as failure patterns associated with stretched nonwovens will be discussed. The implications of various thermal bonding parameters on mechanical performance will be discussed, as well as the reasons for failure patterns around the bond periphery. Further, I will focus on the optimization of fiber manufacturing procedures. Several theoretical models that can be used to evaluate important production parameters will be presented. Finally, specific challenges for nonwoven manufacturing and future research directions will be discussed.

Wenshuo Zhang is a Postdoctoral Associate at Tsinghua University. Her current research focuses on the development and application of novel multi-functional membranes. Prior to joining Tsinghua University in September 2020, Wenshuo was a Ph.D. candidate in Mechanical Engineering at the University of Illinois at Chicago under the guidance of Professor Alexander Yarin. She holds BSc in Chemical Engineering from the Southwest Petroleum University in China and a MSc degree in Chemical Engineering from the Illinois Institute of Technology.

