



Contribution ID: 520

Type: **Oral 20 Minutes**

Droplet Impact on Fabric

Thursday, 17 May 2018 09:08 (15 minutes)

Although droplet spreading on smooth surfaces is well known, spreading on textile materials is still not fully understood. Compared to a solid surface, on textile the liquid can penetrate the holes in the fabric but also spontaneously flow through the porous networks inside the fabric (wicking), making droplet spreading more complex compared to smooth surfaces. Understanding droplet spreading on textile materials is important for applications in the textile industry and forensic research.

We study droplet impact on thin monolament polyester fabric as a function of the fabric pore size and its wettability. First, the difference between droplet spreading on a smooth surface (stainless steel) and the fabric is investigated where the fabric is either placed on a substrate or suspended in the air. We show that a droplet spreads less on the fabric compared to the smooth surface. Furthermore, a difference in spreading is observed between the spreading on fabric with and without substrate due to the liquid penetrating the fabric. Secondly, droplet fragmentation of the penetrating liquid is investigated. Using simulations, we determine the physical processes behind droplet spreading and the subsequent fragmentation.

References

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Session Classification: Parallel 9-B

Track Classification: MS 3.02: Fluid Interactions with Thin, Fibrous Porous Media