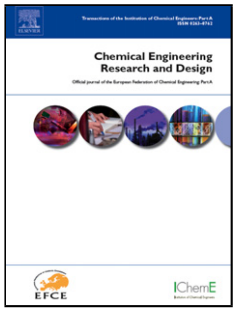

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Footprint of droplets after impact onto paper surfaces with a hydrophobic barrier

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Abstract

This paper presents findings from a study of the impact of liquid droplets onto papers which have been treated to incorporate a hydrophobic barrier. Such papers are currently being explored as new paper-based microfluidic technology for chemical, biological and medical applications, where discrete volumes of liquid (i.e. droplets) are deposited on the paper. We experimentally capture the impingement stage with the aid of high-speed videography and analyze the spreading, retraction and final footprint of the droplets. Understanding the maximum spread and final footprint is important for paper-based devices because it can determine whether or not a droplet that impinges upon them will reach the hydrophilic wicking matrix.

We conclude that the final contact area (footprint) could be tuned simply by varying the impact energy of the droplet and vapor deposition time. In contrast to untreated papers, droplets impinging on treated papers impregnate the porous structure but there is no subsequent wicking, i.e. the contact line always pins, which is explained by the interaction of the droplet with fibers of the paper.

Key words: Drop impact, Footprint, μ-PADs

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