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Patterns from Drying Drops

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Abstract

The objective of this review is to investigate different deposition patterns from dried droplets of a range of fluids: paints, polymers and biological fluids. This includes looking at mechanisms controlling the patterns and how they can be manipulated for use in certain applications such as medical diagnostics and nanotechnology.

This review introduces the fundamental properties of droplets during evaporation. These include profile evolution (constant contact angle regime (CCAR) and constant radius regime (CRR)) and the internal flow (Marangoni and Capillary flow (Deegan et *al.* [22])). The understanding of these processes and the basic physics behind the phenomenon are crucial to the understanding of the factors influencing the deposition patterns. It concludes with the applications that each of these fluids can be used in and how the manipulation of the deposition pattern is useful.

The most commonly seen pattern is the coffee-ring deposit [27] which can be seen frequently in real life from tea/coffee stains and in water colour painting. This is caused by an outward flow known as Capillary flow which carries suspended particles out to the edge of the wetted area. Other patterns that were found were uniform, central deposits and concentric rings which are caused by inward Marangoni flow. Complex biological fluids displayed an array of different patterns which can be used to diagnose patients.