Transport of Solvable and Insolvable Admixtures in Drying Drops

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Vortex motion forming inside a free drying drop placed on a horizontal glass strip in a quiescent air affect transport of solvable and insolvable impurities. The motion is formed due to gravity action on the cooling liquid surface and occupies the whole drop body. The flow consists of arising jet at the drop center and subsurface layer sinking to the outer contact line. Concentration of dissolved or suspended matter is increasing with time in sinking liquid layer due to the water evaporation. For number of solutions Marangoni's stress is essential for increasing convective flow. Concentration of solvable mineral salts is maximal in vicinity of contact line where the first chain of crystals is formed. Motion of separate crystals is registered. In drying suspension of sand nanoparticles regular radial structure is observed. Drying solutions of proteins forms picturesque regular pattern of radial and circular cracks. Mathematical model of the flow is constructed and compared with data of the experiment.