Electronic Supplementary Material (ESI) for Soft Matter.

Supporting Information

For

Ethanol Vapor-Induced Fabrication of Colloidal Crystals with Controllable Layers and Photonic Properties

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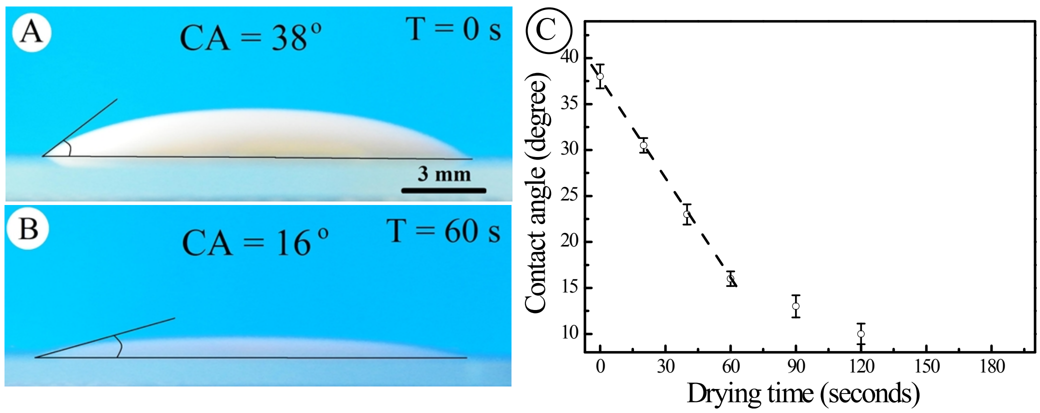

Figure S1. (A, B) Photographs of colloidal suspension droplet at drying time T = 0 s and 60 s for showing contact angles; (C) Contact angle *vs* the drying time. Firstly, the contact angle decreases linearly from T = 0 s to 60 s, mainly due to the constant extracting flux of suspension by wriggle pump. And then, the droplet is too thin (less than 0.9 mm) to brokenly extracting flow in the capillary tube, when the slowing reduction in contact angle may originate from the condensing ethanol.

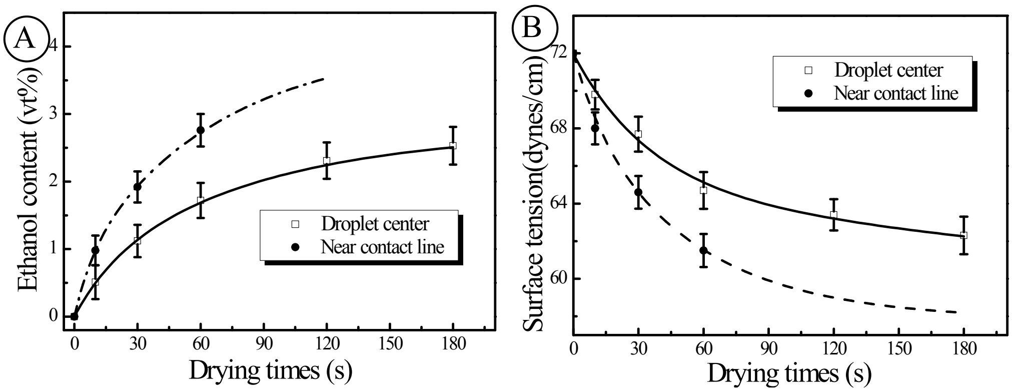

Figure S2. The ethanol content of drying droplet vs the drying time. In the beginning 60s, the ethanol content rapidly increases due to ethanol condensing from vapor to droplet. After that, the drying droplet shrinks its surface area contact with vapor, which reduces the ethanol condensing, thus weakening the increase of ethanol concentration in drying droplet. The ethanol content near to contact line (1 mm) is always higher than that in droplet center, demonstrating that ethanol condensed tends to gather onto the borderline of droplet through the outward flow of solvent.

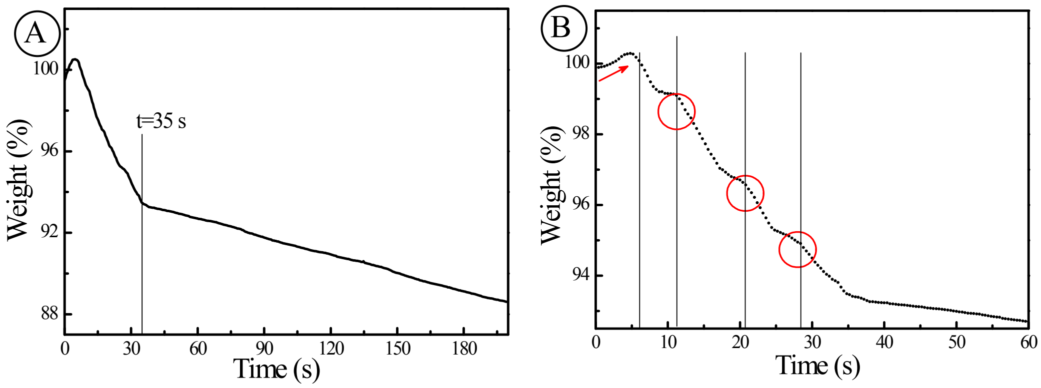

Figure S3. A) Time-dependency of weight loss of colloidal suspension films (7.2 vt%) of ethanol/water mixture (ethanol volume fraction: 5 vt%) analyzed at room temperature in ethanol vapor environment; B) The enlarged weight-loss curve is shown for clarification of the detail of weight loss at beginning stage.

Figure S4. Side-view FESEM images of multi-layer colloidal crystals dried suspension films at 7.2 vt% colloidal concentration in ethanol vapor environment with the different ethanol fraction: A) 6-layered arrays for 5 vt%; B) 9-layered arrays for 10 vt%; C) 12-layered arrays for 15 vt%; D) 16-layered arrays for 20 vt%. With the 10 vt% ethanol fraction, 9-layer colloidal crystals are deposited on the substrate by drying suspension film in ethanol vapor, while the layer number of colloidal crystals increases to twelve when the drying experiment is performed with the ethanol fraction of 15 vt%. If the ethanol content in suspension raises to 20 vt%, the evaporation of mixed solvents produces 16-layer arrays of colloidal crystal film. Further increasing the ethanol concentration to 30 vt% results in a 20-layered colloidal crystal film on substrate with higher-ordered array. The high ethanol content in suspension slows down the shrinking of liquid film towards center through depressing the ethanol condensation from background gas, which gains enough time for the deposition of multi-layered crystals.