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Pattern formation and liquid crystallinity in evaporating drops of gold nanorods. KYOUNGWEON PARK, VIVEK SHARMA, School of Polymer, Textile and Fiber Engineering, MOHAN SRINIVASARAO, School of Polymer, Textile and Fiber Engineering and School of Chemistry and Biochemistry, Georgia Institute of Technology, Atlanta, GA — The drying drops of colloidal rods on glass provide a coffee ring type stain accompanied by formation of highly birefringent deposit, suggesting lyotropic liquid crystalline phase forms prior to deposit formation. Further, Liesegang ring like patterns which have concentric deposits, appear on drying, only under specific conditions, and in optical microscope show similar birefringent bands. Similar experiments done on carbon coated copper TEM grids and observed under TEM, show smectic and nematic-like phases as well as create vortex-like assembly of nanorods reminiscent of defect structures in liquid crystals, and are likewise explained in terms of lowest energy configuration of twist configuration. In the present, work we compliment the rich experimental observations, by proposing mechanisms that explain formation of concentric rings, as well as other complex patterns using both the existing framework based on coffee ring stain models and on basis the observed liquid crystalline phase behavior.

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