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Drying Mediated Pattern Formation From a Restricted Geometry JUN XU, ZHIQUN LIN, Department of Materials Science and Engineering, Iowa State University, Ames, IA 50011 — There is much interest in causing patterns (of dyes, nanoparticles, or polymers) to emerge spontaneously on surfaces. A main characteristic pattern known as the "coffee ring" formed when the contact line of an evaporating drop becomes pinned, ensuring that liquid evaporating from the edge is replenished by liquid from the interior, so that outward flow carries the nonvolatile dispersion to the edge. Here we report the remarkable observation that a complex structure consisting of a periodic family of hundreds of concentric rings with definite spacing can be achieved when solvent evaporates irreversible from a restricted geometry. Each ring is approximately nanometers high and micron wide. The observed micron size rings are governed by the imposed geometry, the solution concentration and the solvent properties. The mechanism, which is believed to be a series of successive pinning and depinning of the contact line as solvent evaporates, will be discussed. This simple yet novel approach affords a means to produce and organize surface patterns in a well-ordered gradient fashion.

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