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Coffee ring effect resulted conductive nanowire patterns by evaporating colloidal suspension droplets without sintering process[1] XIAOFENG WANG, BAEKHOON SEONG, HADI TEGUH YUDISTIRA, DOYOUNG BYUN, Sungkyunkwan University — Drying colloidal suspensions containing non-volatile solute will form a ring like pattern, which is called "coffee ring effect." Here, we present the coffee ring effect with silver nanowires dispersing into DI water, resulting in a highly dense-packed nanowire ring patterns. The effect of nanowire length, concentration, droplet size, and substrate temperature were investigated. With shorter nanowires, a distinct ring could be obtained. Meanwhile, the concentration of the colloidal suspension was found to affect the ring width. The droplet size and nanowire length played a significant role in affecting the occurrence of the coffee ring effect. When smaller droplets (i.e., less than 150 μm) containing long nanowires ($\sim$ 20 μm), the coffee ring effect was suppressed. While smaller droplets containing short nanowires ($\sim$ 1 μm), the coffee ring effect was not affected. By increasing the temperature of the substrate, multi-ring pattern was formed inside the original ring. The resistivity of the semi-circle of the nanowire ring was measured, and had a minimum value of 1.32 $\times$ 10-6 Ωm without any sintering process. These findings could be exploited to basic study of ring stain effect as well as the practical use, such as evaporative lithography and ink-jet printing for conductive film and display.

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