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Fabrication of flexible metal micro-grid transparent electrode via novel method

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Recently, we reported a micro-grid metal electrode on glass which shows an excellent transmittance (=97.9%) by the control of the grid spacing as well as high conductivity ($R_{sh}=25\Omega\text{ sq}^{-1}$) with optimized thickness of metal. This micro-grid electrode would be useful for various applications such as solar cell, LED, and display. In this work, we developed a simple and facial method to produce the micro-grid electrode on flexible substrate. After fabricating a master substrate (Si) which has a micro-grid pattern, we deposited adhesive metal (Cr) and seed layer Ag on the master substrate subsequently. Then we deposited additional Ag on the master substrate through electroplating, and by transferring this micro-grid patterned metal to another flexible substrate, we fabricated a flexible micro-grid electrode. In this process, we can control the thickness of metal electrode easily because the electroplating is a simple solution-based process. Furthermore, additional photolithography process is not required to fabricate a flexible micro-grid electrode after fabrication of the master substrate which would be reusable. Thus, the use of a novel method to fabricate micro-grid metal electrode on a flexible substrate presents a unique opportunity to develop highly efficient flexible energy devices.