Cold Isostatic-Pressured Silver Nanowire Electrodes for Flexible Organic Solar Cells via Room-Temperature Processes

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Transparent conducting electrodes (TCEs) are considered to be an essential structural component of flexible organic solar cells (FOSCs). Silver nanowire (AgNW) electrodes are widely used as TCEs owing to their excellent electrical and optical properties. The fabrication of AgNW electrodes, has faced challenges in terms of forming large uniform interconnected networks so that high conductivity and reproducibility can be achieved. In this study, we demonstrate a simple method for creating an intimate contact between AgNWs that uses cold isostatic pressing (CIP). This method increases the conductivity of the AgNW electrodes, which enables the fabrication of high-efficiency inverted FOSCs that have a power conversion efficiency of 8.75% on flexible polyethylene terephthalate (PET) with no short-circuiting occurring as the CIP process minimized the surface roughness of the AgNW electrode. This allowed us to achieve 100% manufacturing yield of FOSCs. Furthermore, these highly efficient FOSCs have been proven to only be 2.4% less efficient even for an extreme bending radius of R ≈ 1.5 mm compared to initial efficiency.

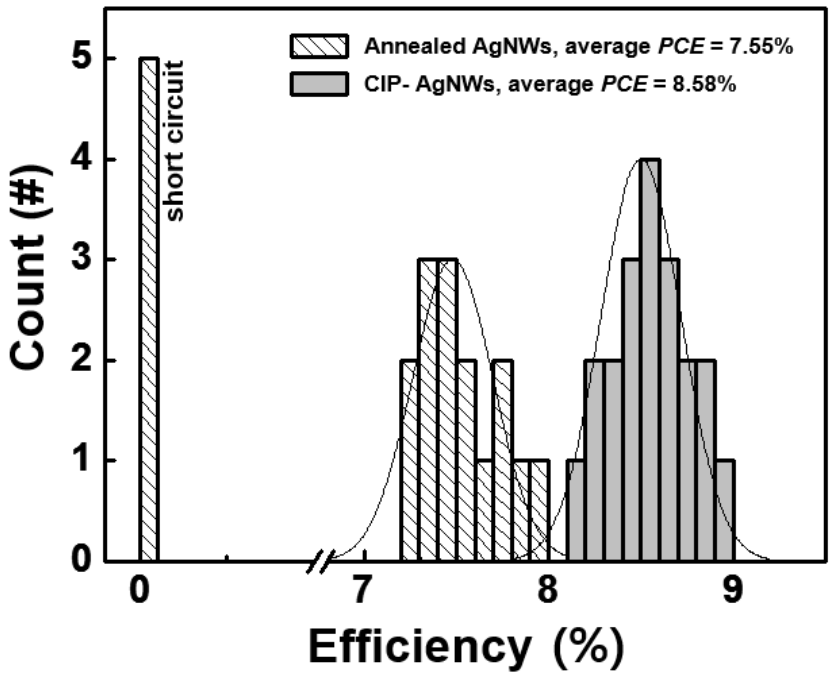

Figure. A histogram comparing the difference in the PCEs obtained from the annealed and CIP-treated AgNW electrodes.