Silver nanowires based stretchable strain gauge for printed electronics

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Recently, many researchers fabricated the electrode by pouring the Ag NWs suspension several times on their mask layer attached substrate (i.e., screen patterning) and investigated the electrical characteristics. Although this method is simple but it is hard to control the amount of Ag NWs liquid suspension because undesired pattern is formed due to permeation through the mask. The previous work is not a practical method and has difficulty to enhance efficient productivity for any application in terms of the material consumption and the arbitrary patterning availability. Therefore, in this study, we suggest and fabricated a stretchable Silver nanowires (Ag NWs)/PDMS composite strain sensor with arbitrary micro-pattern electrodes using dispensing nozzle printing.

In order to ensure a mechanically stable design, we proposed two types of electrodes: patterns of overlapped rings and diamonds. We also demonstrated that the electrical resistance could be modified according to the printing speed because the number of conductive fillers was proportional to the liquid ejection time. We also conducted static simulation for the two geometries to study the effect of the patterns when the strain sensor is stretched. Based on experimental results, it is expected that directly drawn electronic skin (E-skin) via the printing method can be fabricated with multifunctional sensing abilities in the near future.

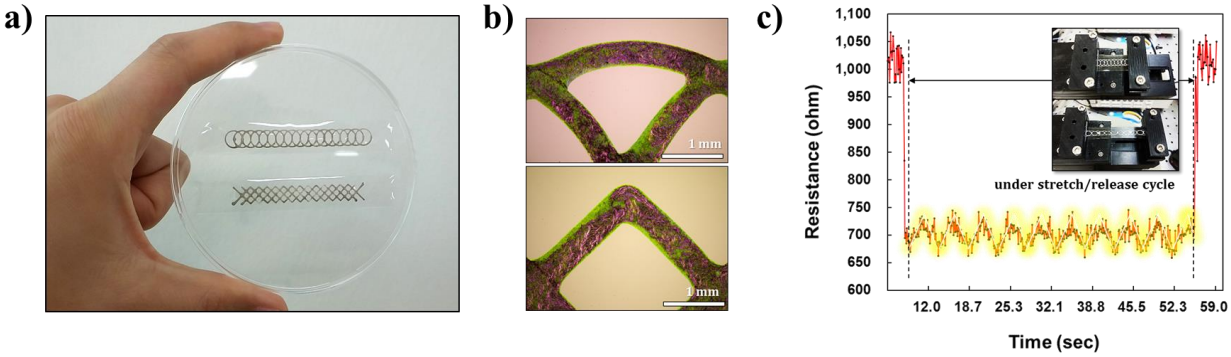

Fig. 1. (a and b) A snapshot of the ring and diamond shaped Ag NWs/PDMS composite strain gauge; (c) Time response of our printed strain sensor

Acknowledgment

This research was supported by the Basic Science Research Program through the National Research Foundation of Korea (NRF) (Grant number: 2014-023284) and the Global Ph.D. Fellowship Program through the National Research Foundation of Korea (NRF) (Grant number: NRF-2013H1A2A1032532).