

Printed Graphene Strain Sensors on Bandages for Wearable Applications

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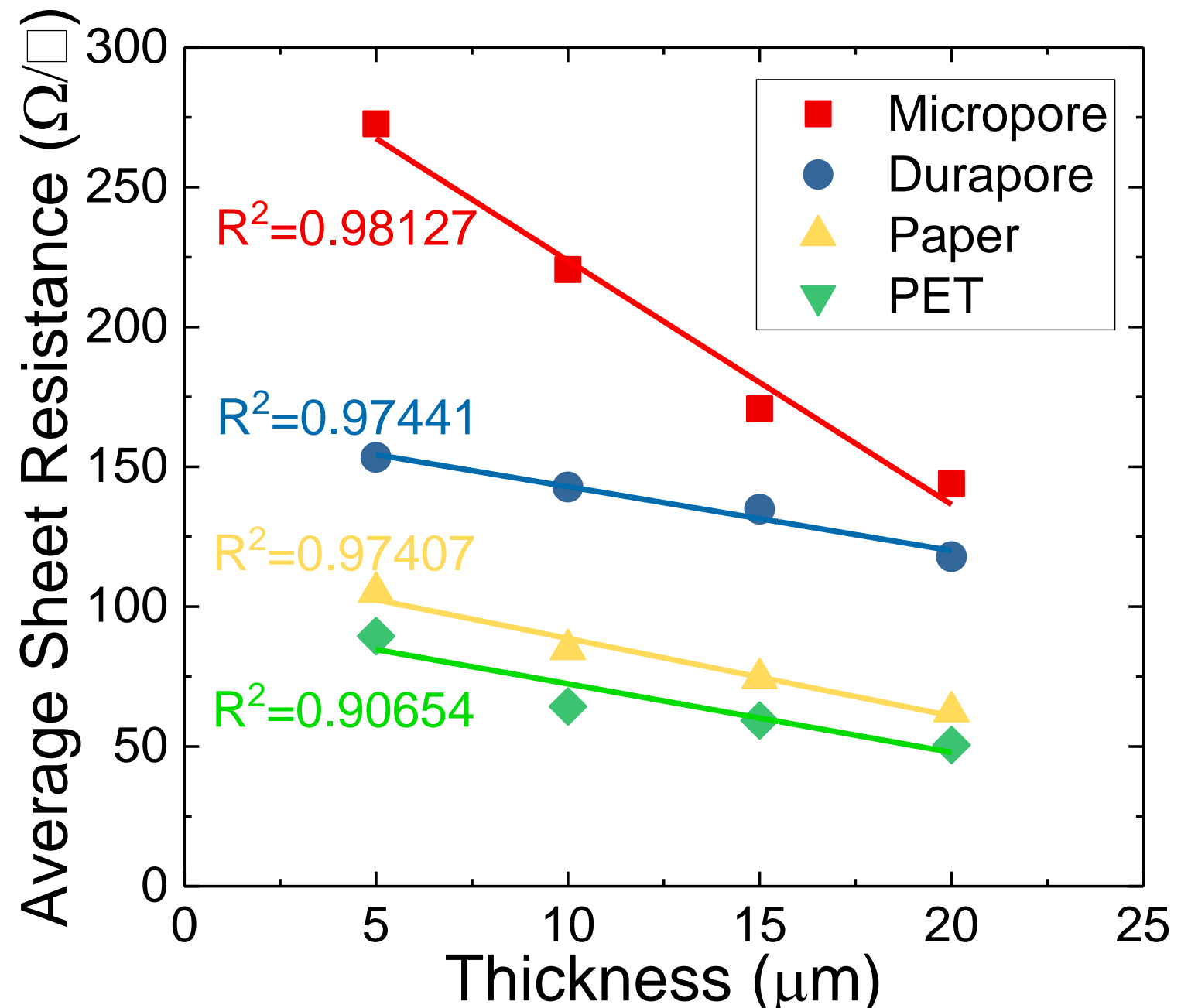
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1. Introduction

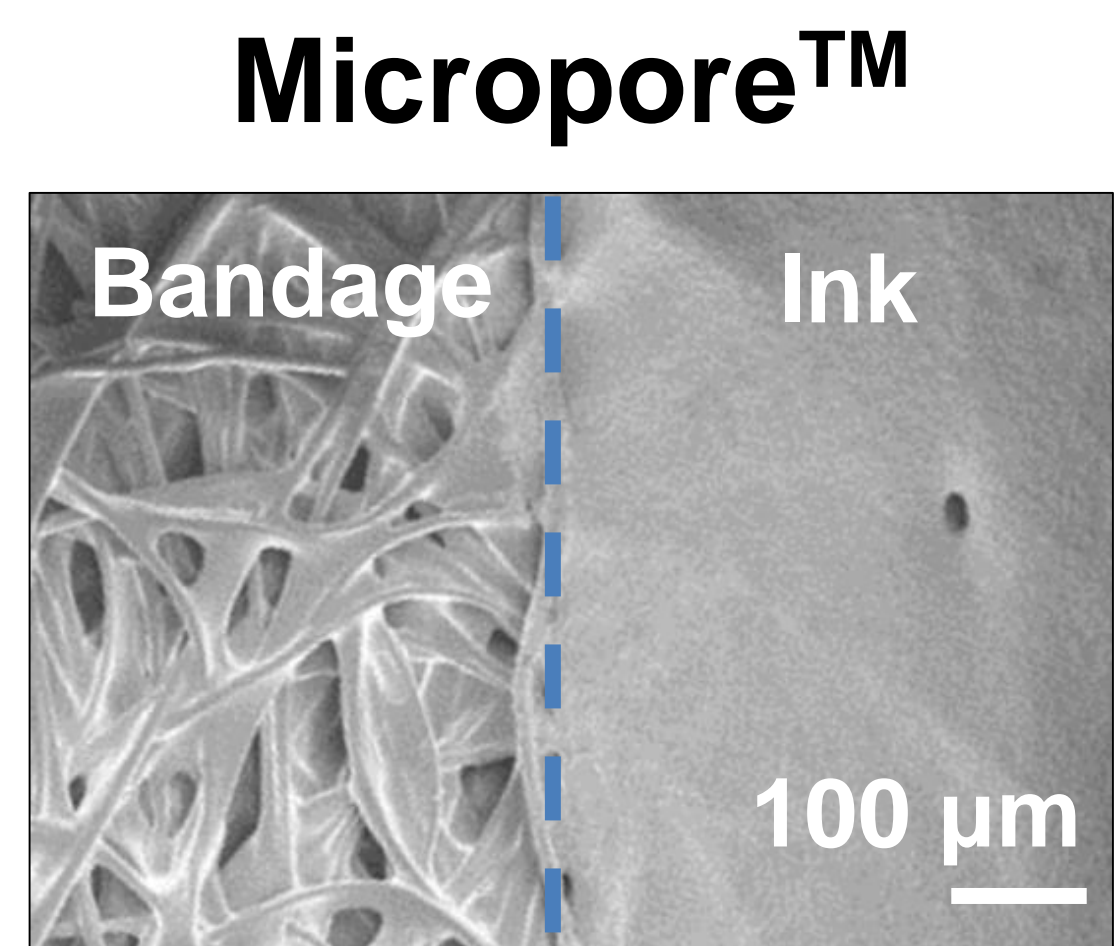
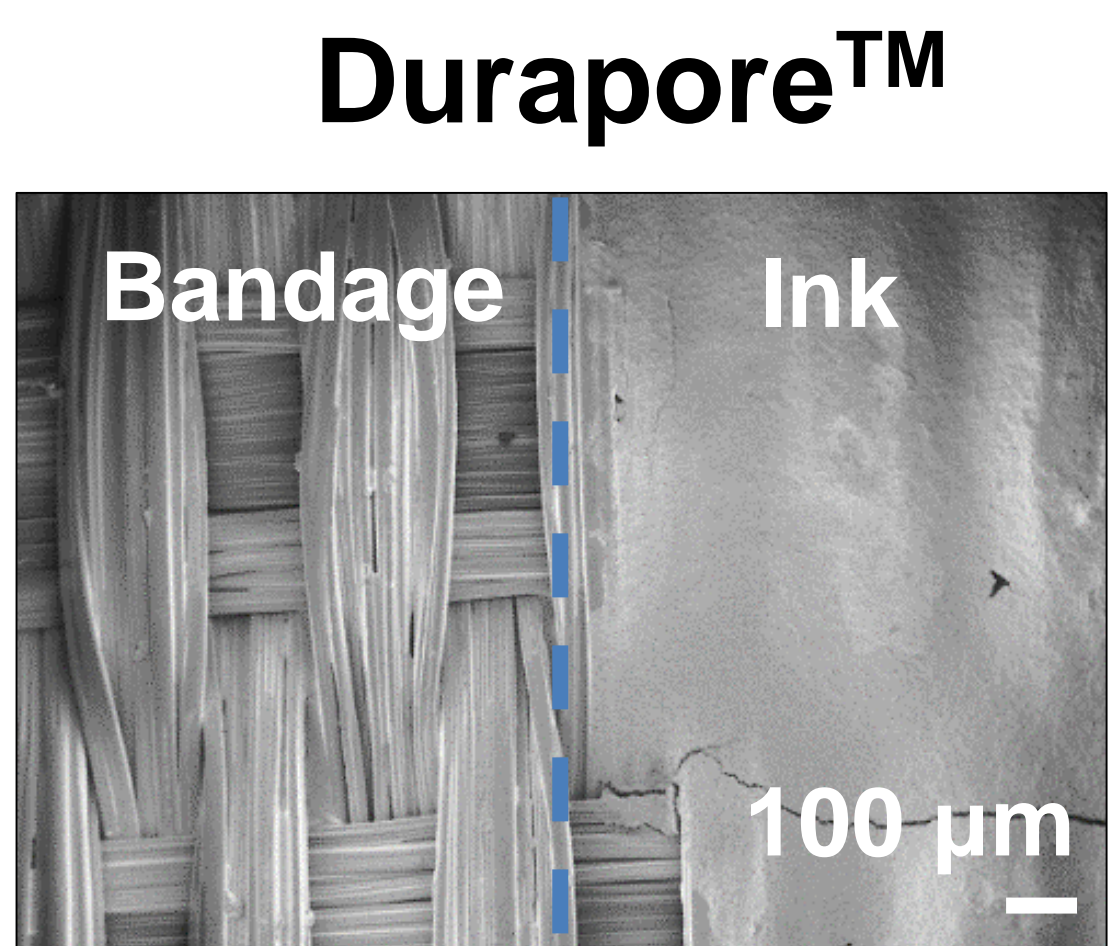
- Graphene based strain sensors were fabricated using a simple, scalable process: screen printing.
- The sensors were printed on adhesive bandages that adhere directly to the skin.
- The sensors fabricated were capable of human motion detection.

2. Sensor Optimisation

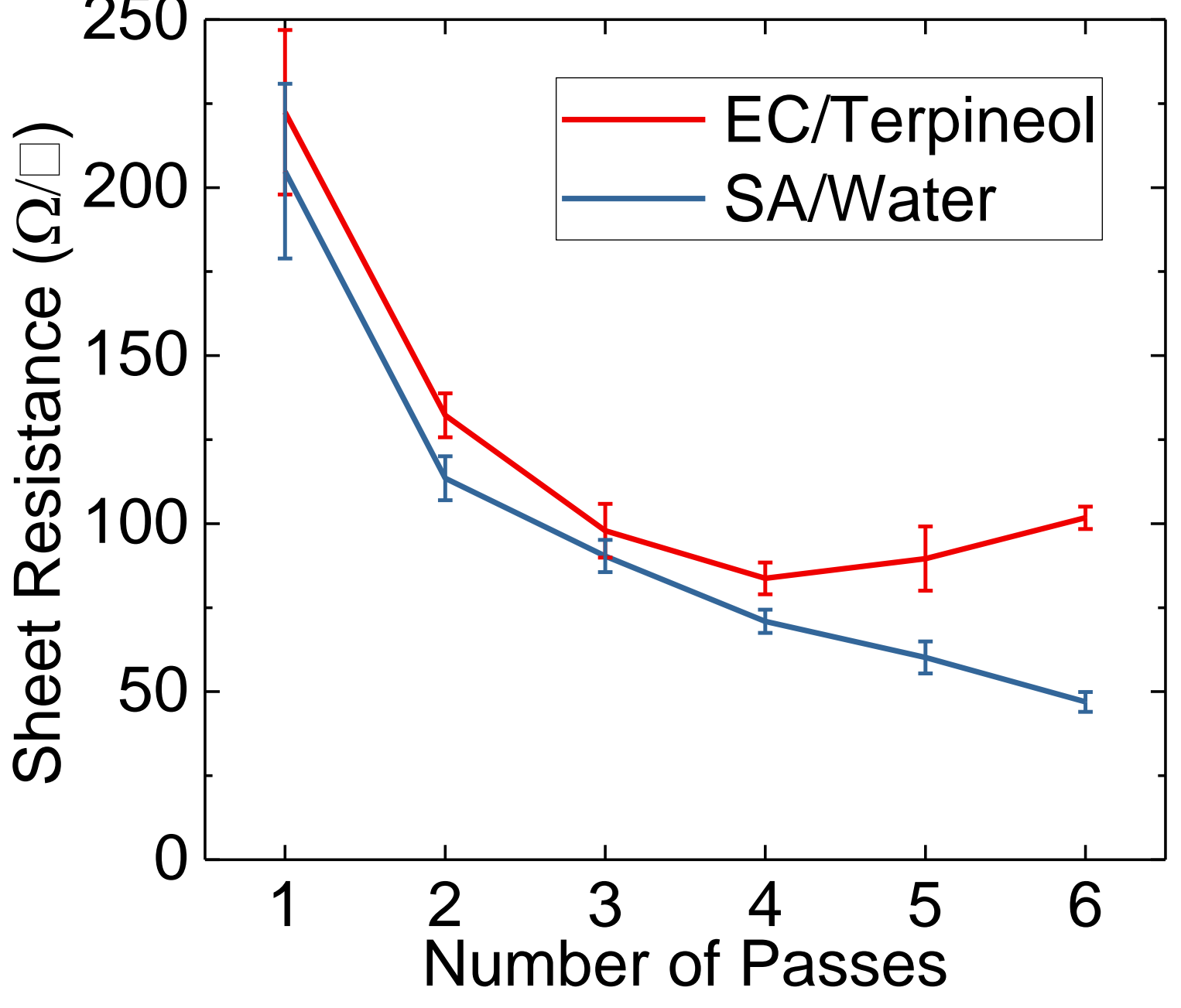
Thickness Test and Bandage Selection



- Two bandage materials tested were:
 - Durapore™ (silk-based)
 - Micropore™ (paper-based)



Number of Passes of Print

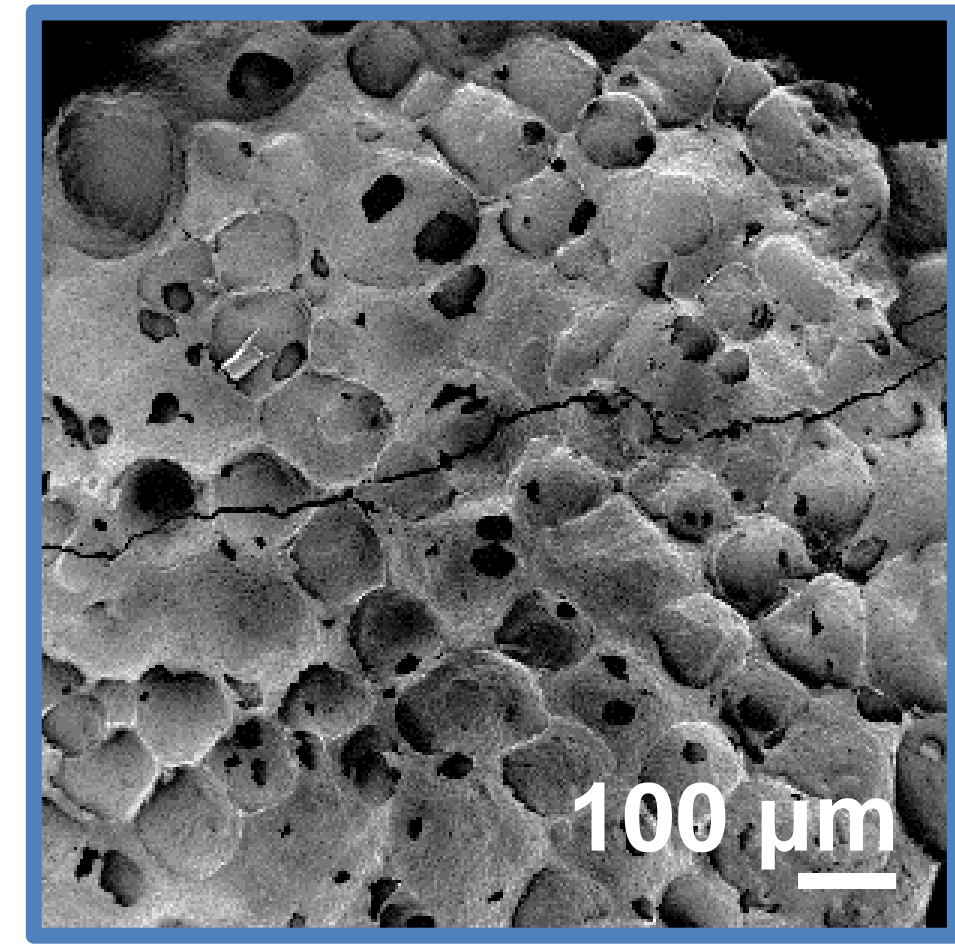


- Determined for the two inks formulated.
- Compromise at 4 passes for SA based ink.

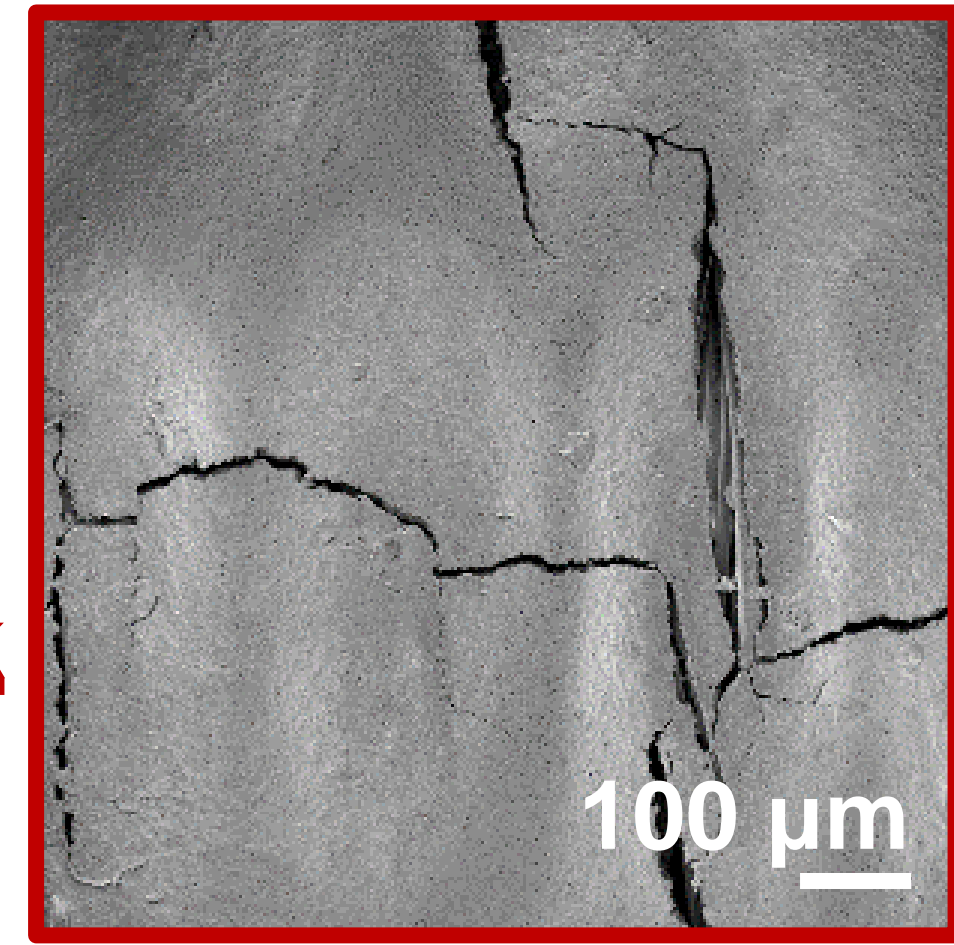
- EC – Ethyl cellulose
- SA – Styrene Acrylate

3. How the Sensor Works

- Resistance change due to strain was caused by the propagation of cracks in the printed film [1,2].



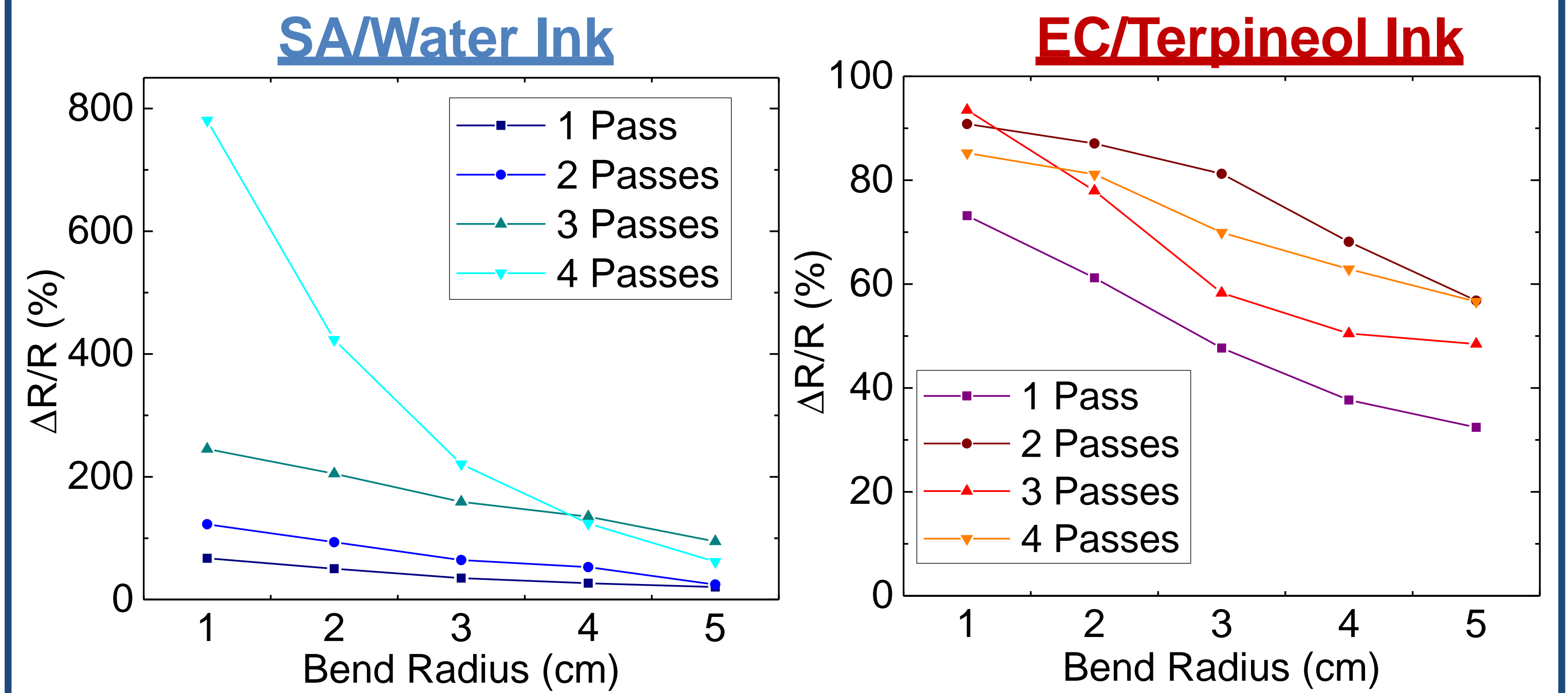
SA/Water Ink



EC/Terpineol Ink

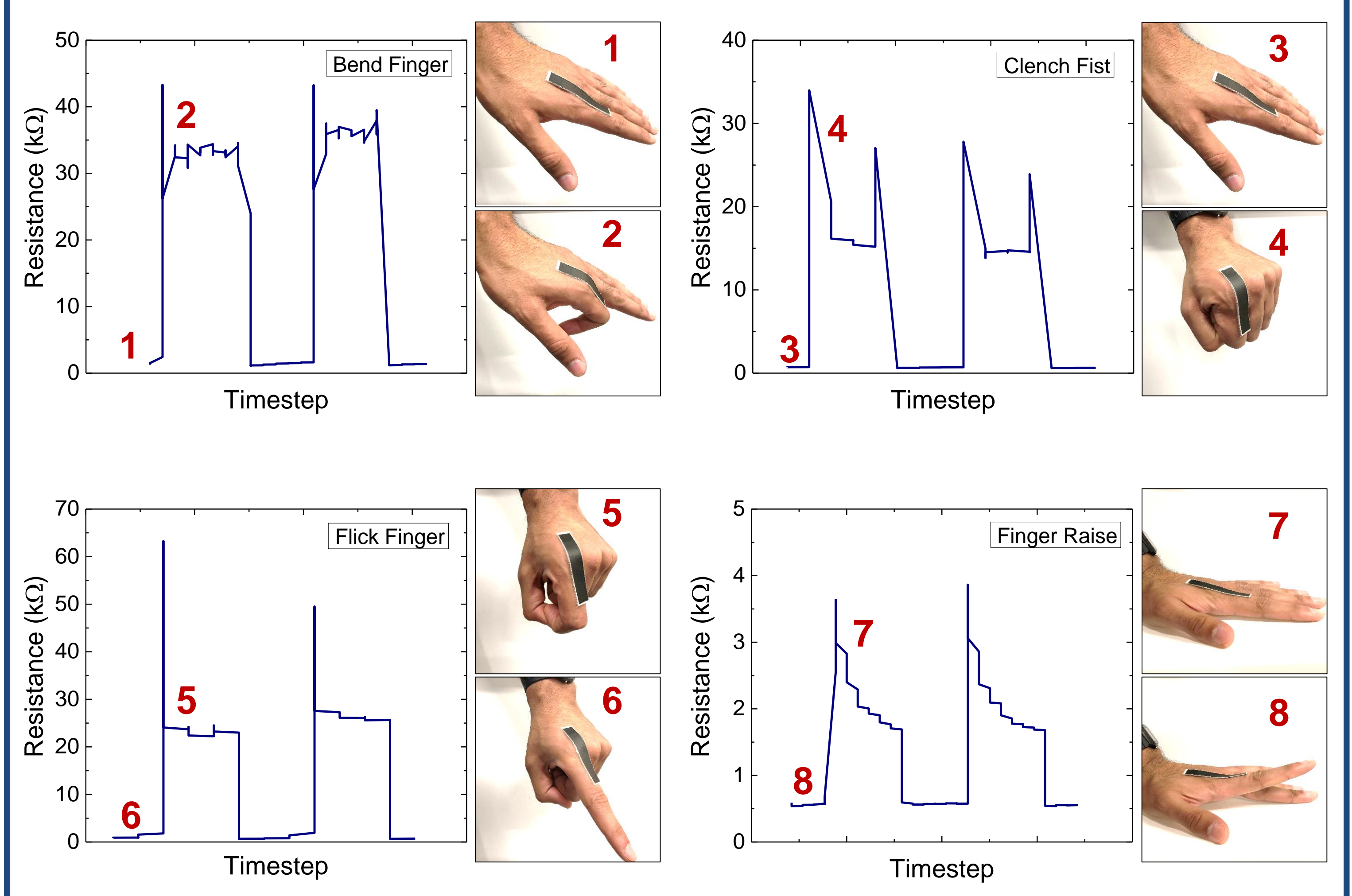
4. Sensor Performance

- Bending tests were conducted using different bending radii.



5. Sensing Different Hand Motions

- Fabricated sensors were tested on-hand yielding resistance profiles.



- Different hand motions repeatedly gave unique resistance profiles. May be exploited for applications such as remote motion control of robotics.

Further Work

- Conduct durability tests, such as 10,000 bend test.
- Determine gauge factor and stretchability of the sensor.
- Explore multi-directional strain sensing.

Acknowledgments



References

- [1] M. Amjadi *et al*, Adv. Funct. Mater., **26**(11), 1678-1698 (2016).
- [2] M. Li *et al*, ACS Appl. Mater. Interfaces, **6**(2), 1313-1319 (2014).