

Design Parameters with Chosen Materials

- **Substrate:**
 - **PDMS / or dragon skin**, chosen for its flexibility, biocompatibility, and compatibility with both aqueous and organic solvents, making it ideal for wearable electronics. **Treat the surface with acetone or plasma etcher to increase adherence.**
 - **Alginate bioplastic film** is flexible, biocompatible and absorbs ambient humidity, can amplify nanowire charge. Treat the surface to increase adhesion and remove excess glycerol (plasticizer).
- **Electrode Material: Silver (Ag)**, known for its high electrical conductivity. The choice of Ag as the bottom electrode is excellent for efficient current collection.
- **Electrolyte:** PVA/KOH offers the best stability with silver electrodes, reducing the risk of corrosion while still providing good ionic conductivity and mechanical properties suitable for flexible devices.
- **Number of Finger Pairs:** Adjusting to **8 finger pairs** to balance between increased surface area for charge storage and the manageability of design complexity on a PDMS substrate.
- **Electrode Dimensions:**
 - Width (w): Considering the varying widths from both concepts, a width of approximately **500 μm** is suggested for a balance between high surface area and fabrication feasibility.
 - Spacing (s): A spacing of **200 μm** , optimizing the distance for ion transport within the electrolyte while maintaining compact device dimensions.
 - Length (l): Given the active area and the substrate choice, a length that accommodates the 8 finger pairs within the PDMS substrate size constraints, ideally aiming for a compact design that maximizes the utilization of the surface area. I.e. **200 μm** ?
- **Active Surface Area: Targeting around $1 \times 1 \text{ cm}^2$** , suitable for wearable applications, offering a good balance between performance and device size.
- **Overall Film Thickness:** Adapting to the materials, an overall device thickness of **<100 μm** for the electrodes would maintain flexibility and conformability on a PDMS substrate.

Ink deposition parameters:

| Sensitive Material | Electrodes | Substrate | Range (°C) | TCR | |
|----------------------------------|---------------------|------------------|------------|----------------------------------|-------------------|
| AgNW (spray coated) | AgNW (spray coated) | PI (spin-coated) | 25-60 | 0.47 $\Omega/^{\circ}\text{C}$ | Cui, 2019 |
| Cross linked PEDOT:PSS (printed) | Ag (Printed) | PEN | 25-50 | -0.77 ($\%/^{\circ}\text{C}$) | Wang, 2020 |
| rGO | Au | PI | 25-45 | -1.3 ($\%/^{\circ}\text{C}$) | Liu, 2019* |
| rGO | | PET | 30-100 | -0.63 ($\%/^{\circ}\text{C}$) | Liu, 2018** |
| PEDOT:PSS (printed) | Ag (printed) | PET | 20-70 | -0.8 ($\%/^{\circ}\text{C}$) | Rivadeneyra, 2019 |
| PEDOT:PSS (drop-casted) | Ag (printed) | PI | 28-50 | -3.202 ($\%/^{\circ}\text{C}$) | Khalaf, 2022 |
| rGO (drop-casted) | Cu | PI | 35-45 | -0.7429 $\%/^{\circ}\text{C}$ | Sahatiya, 2016** |
| PEDOT:PSS/RGO ink (drop-casted) | Al (sputtering) | Kapton | 30-45 | -3.36($\%/^{\circ}\text{C}$) | Seifi, 2022*** |