

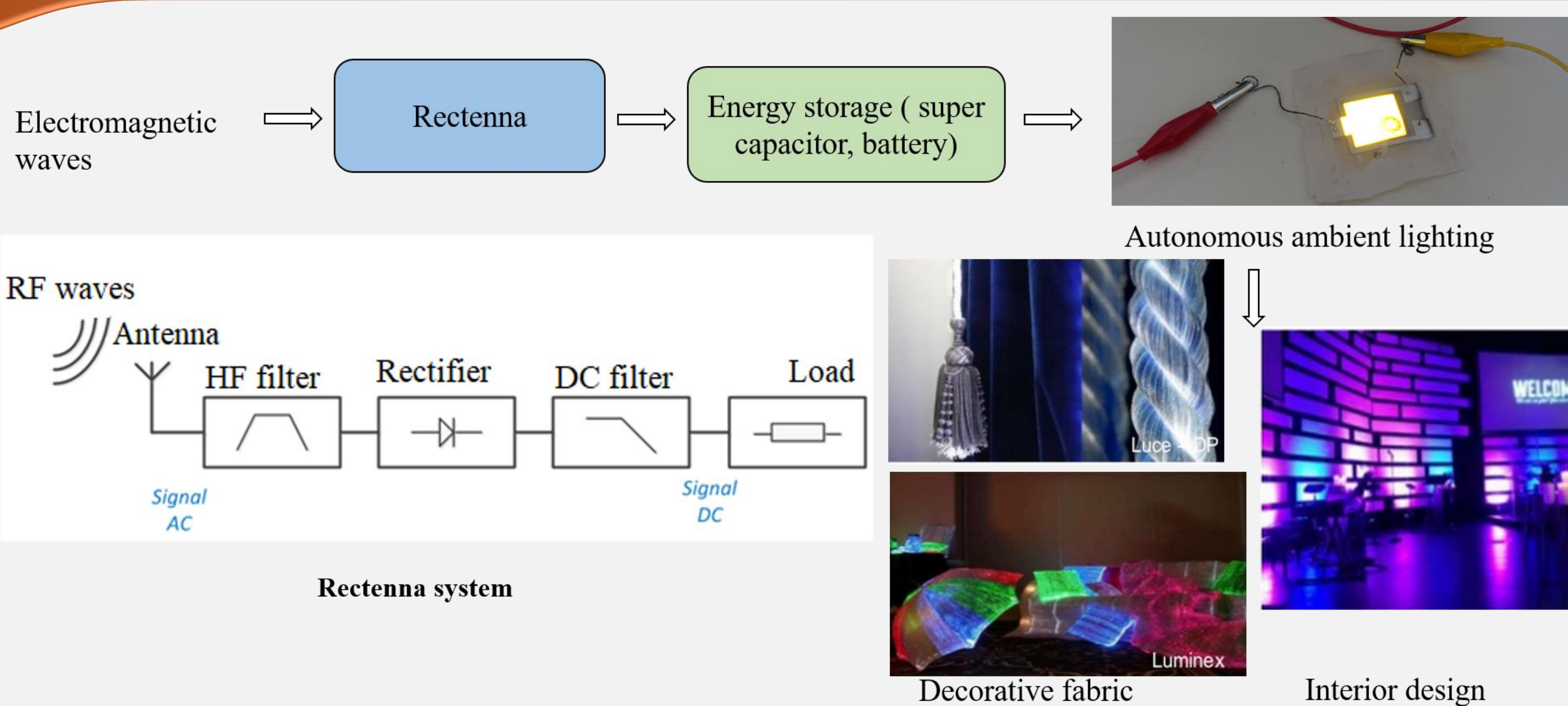
Pentacene organic diode with very low turn on voltage for RF energy harvesting applications

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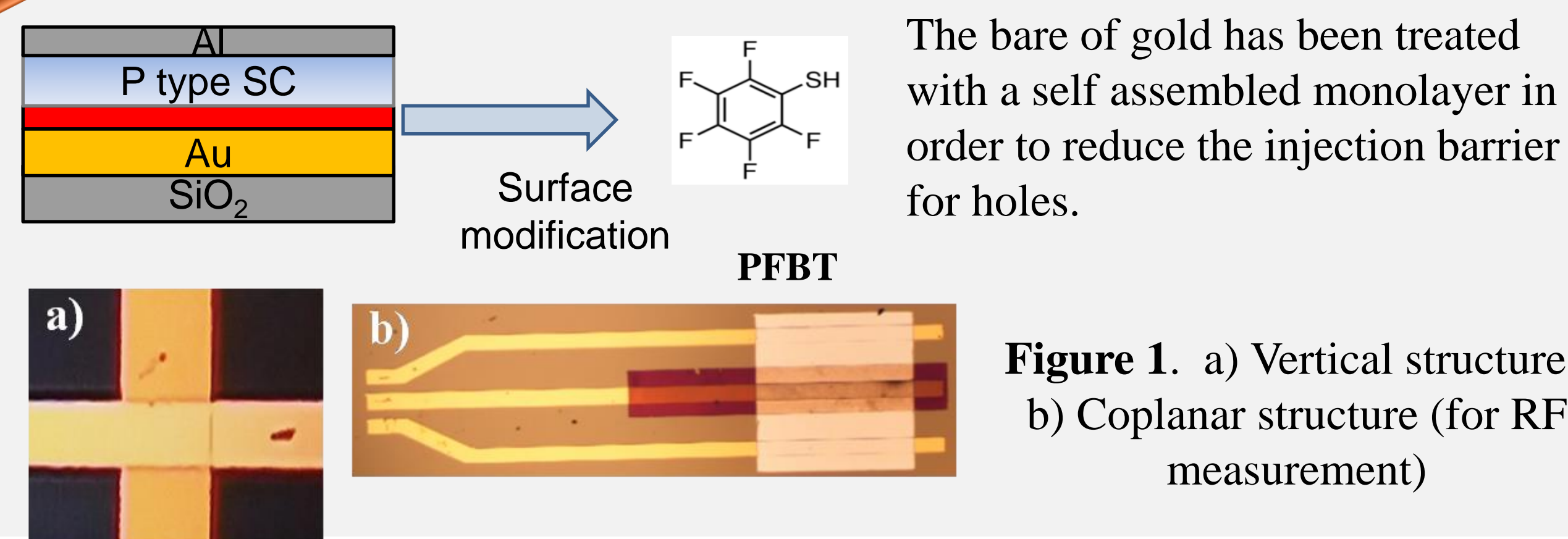
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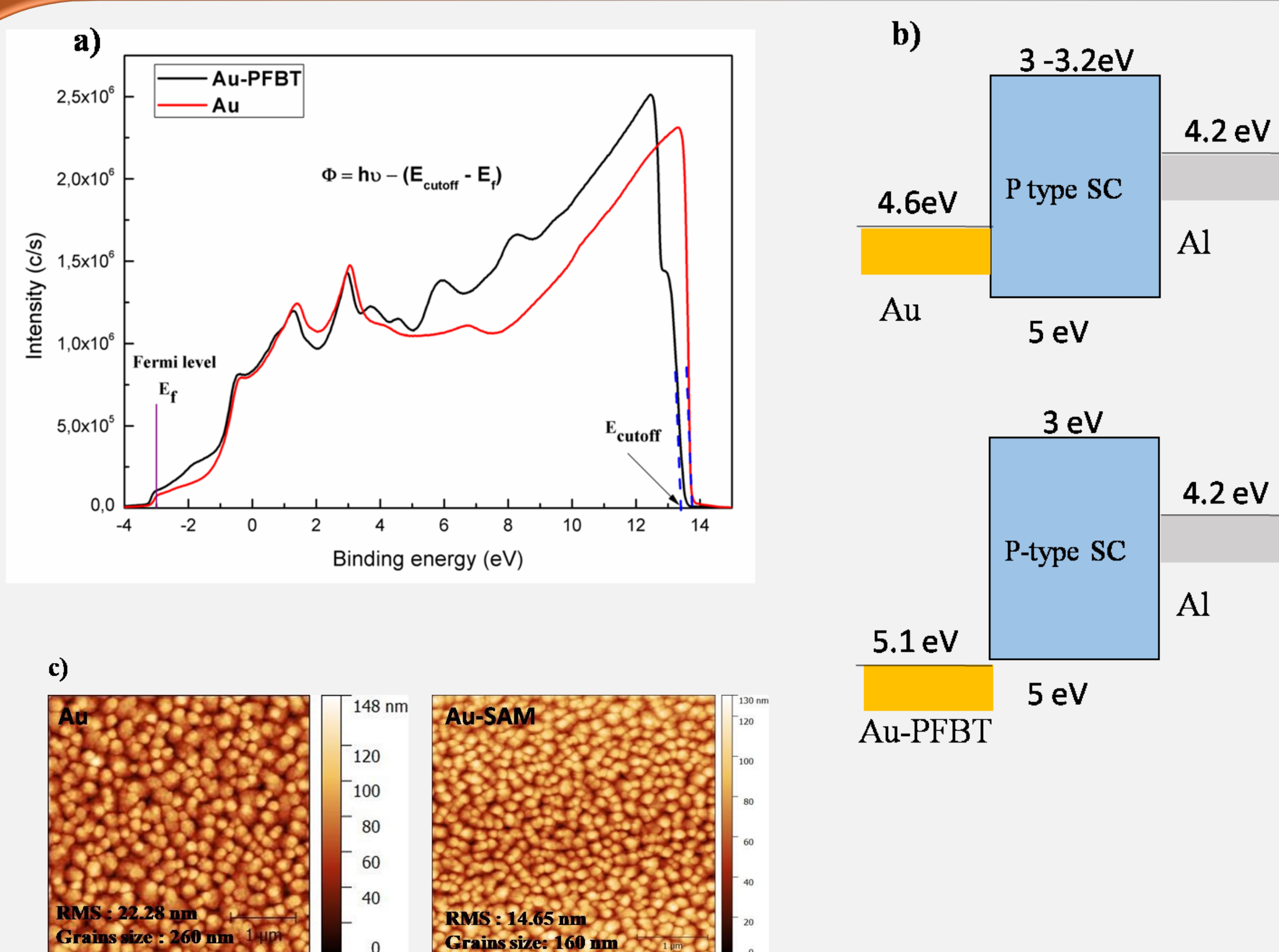
Introduction



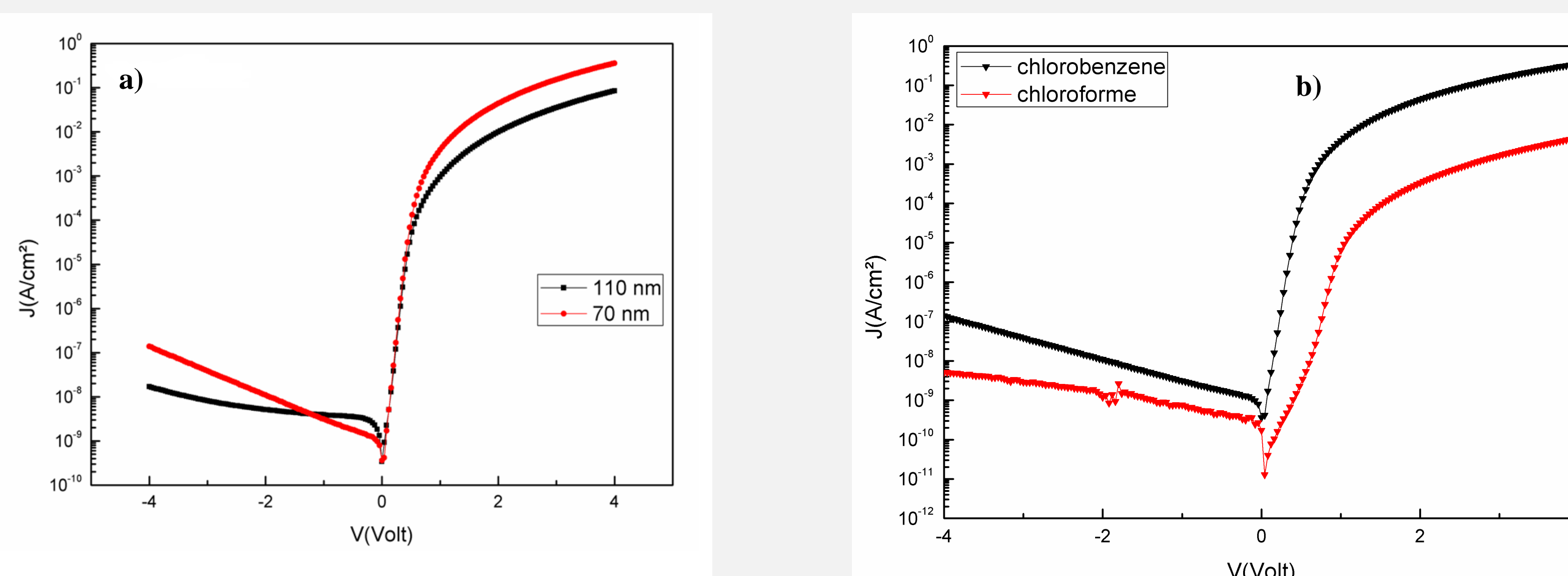
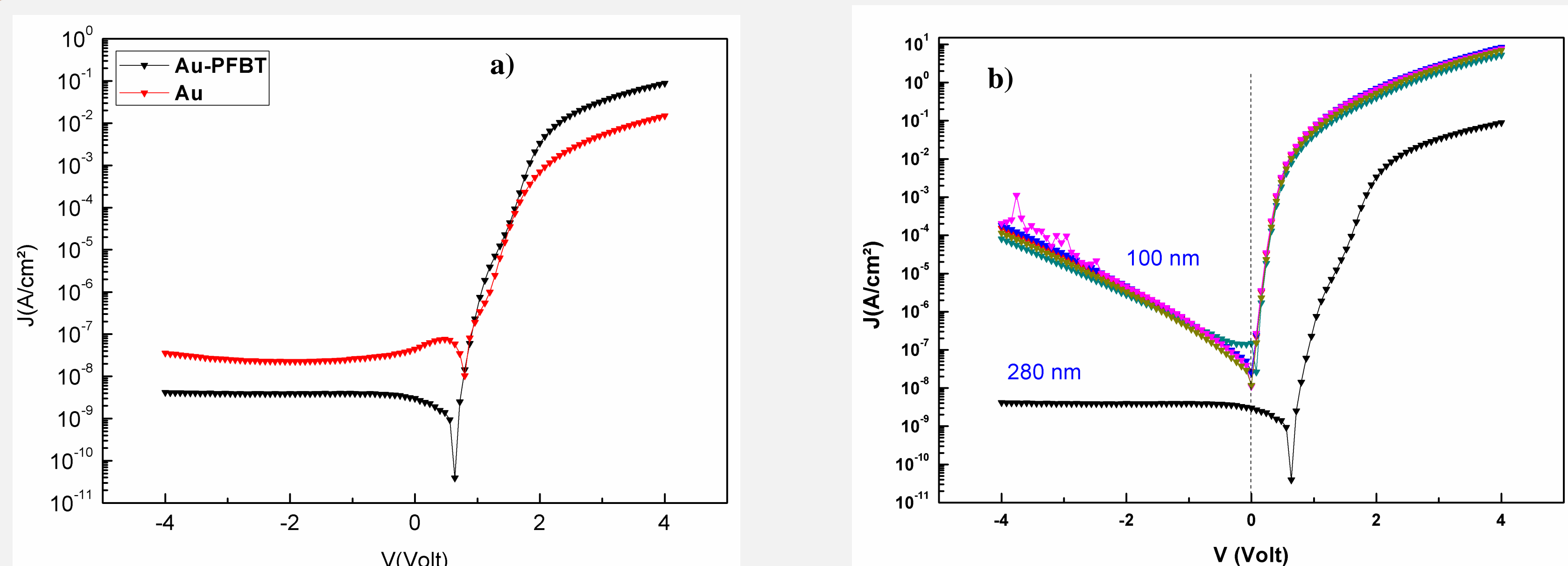
Experimental part



Physical analysis



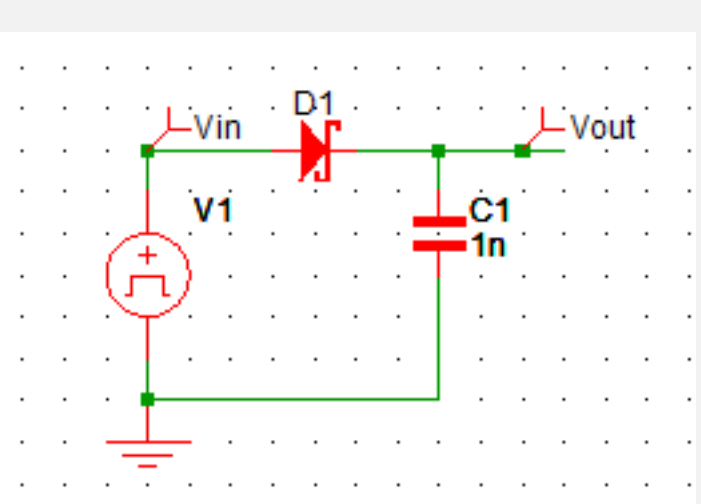
Oligomers and polymers rectifiers



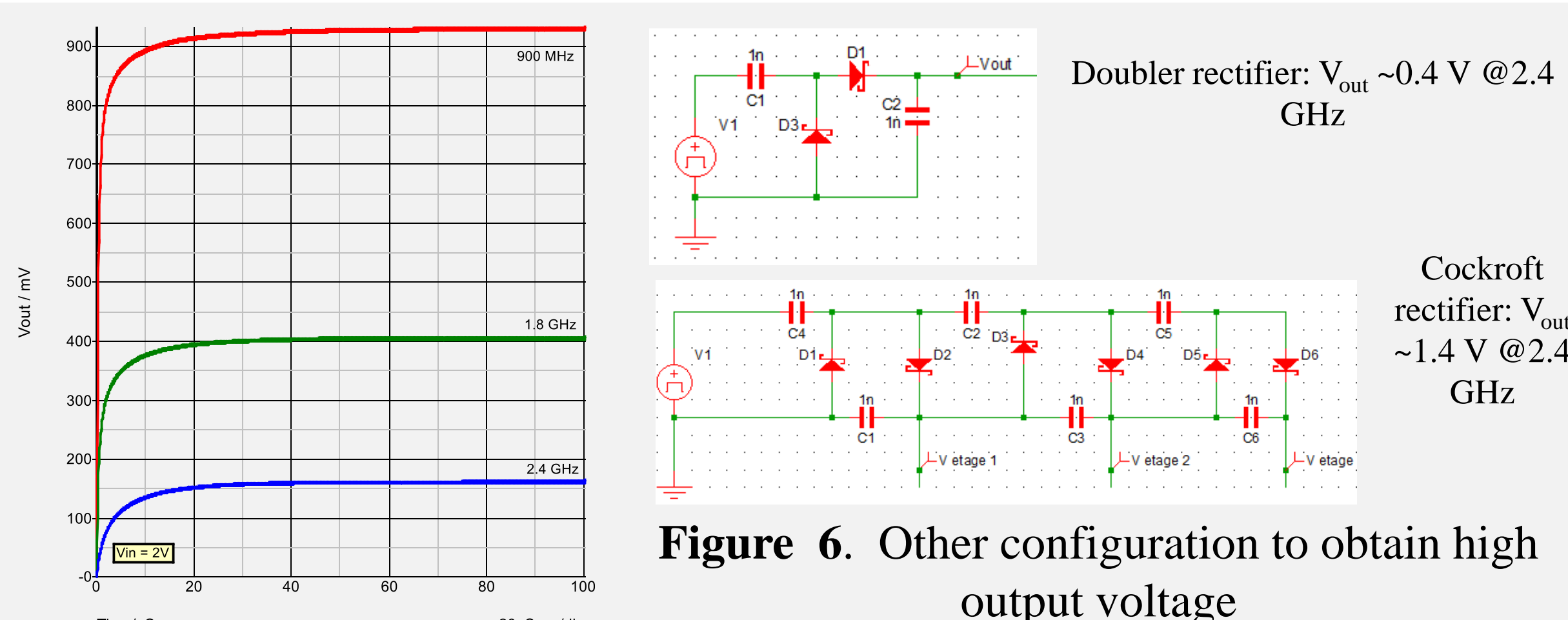
- High rectification ratio for the diode with PFBT coated Au (up to 10^7).
- Very low turn on voltage (20-80 mV) obtained with reducing the thickness for pentacene layer and with the use of the appropriate solvent for polymers materials.

Simulation

Figure 5. Simulation of half wave rectifier



$V_{out} = 0.15 \text{ V @ } 2.4 \text{ GHz}$



Pentacene flexible rectifier for smart textile

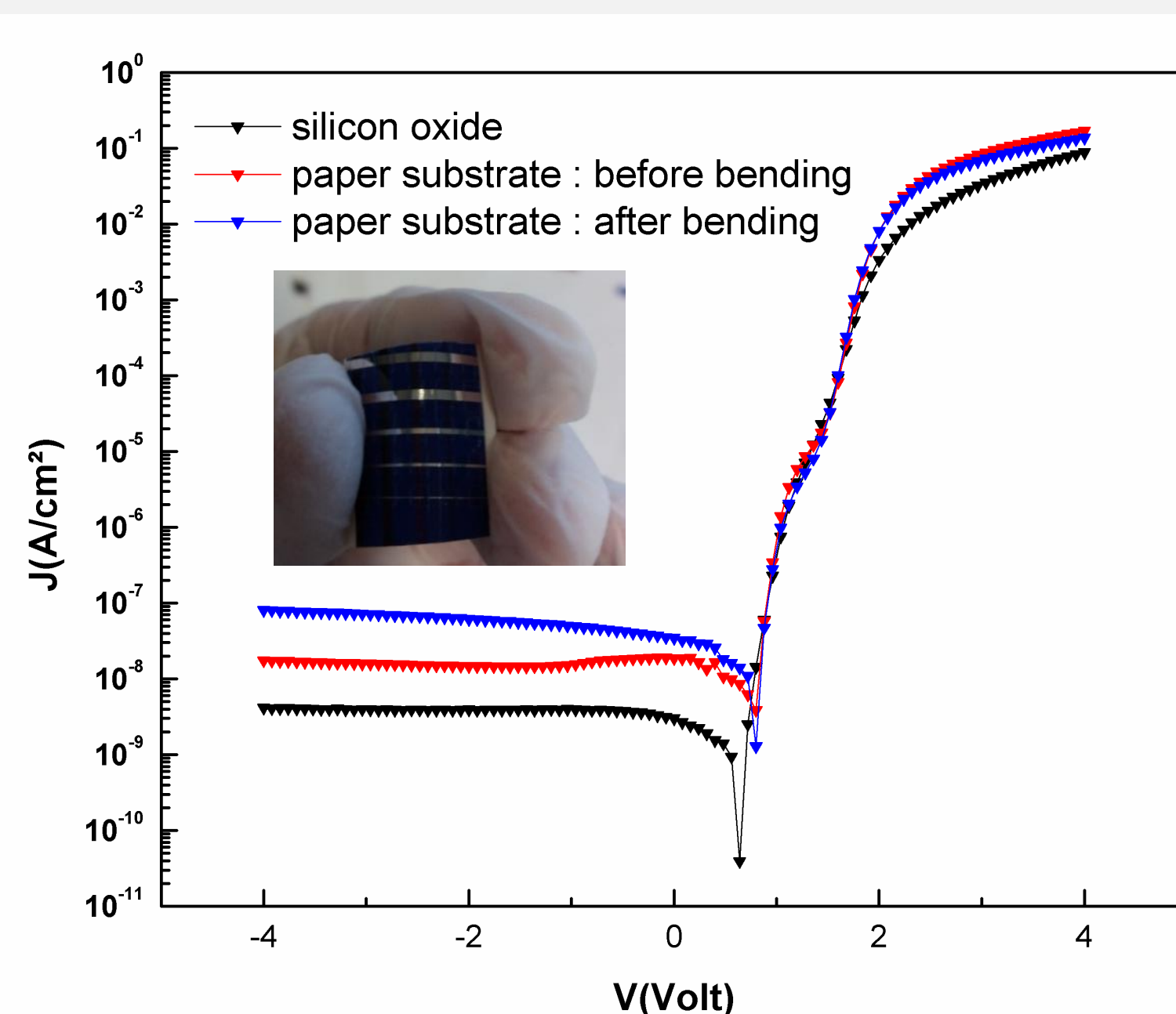
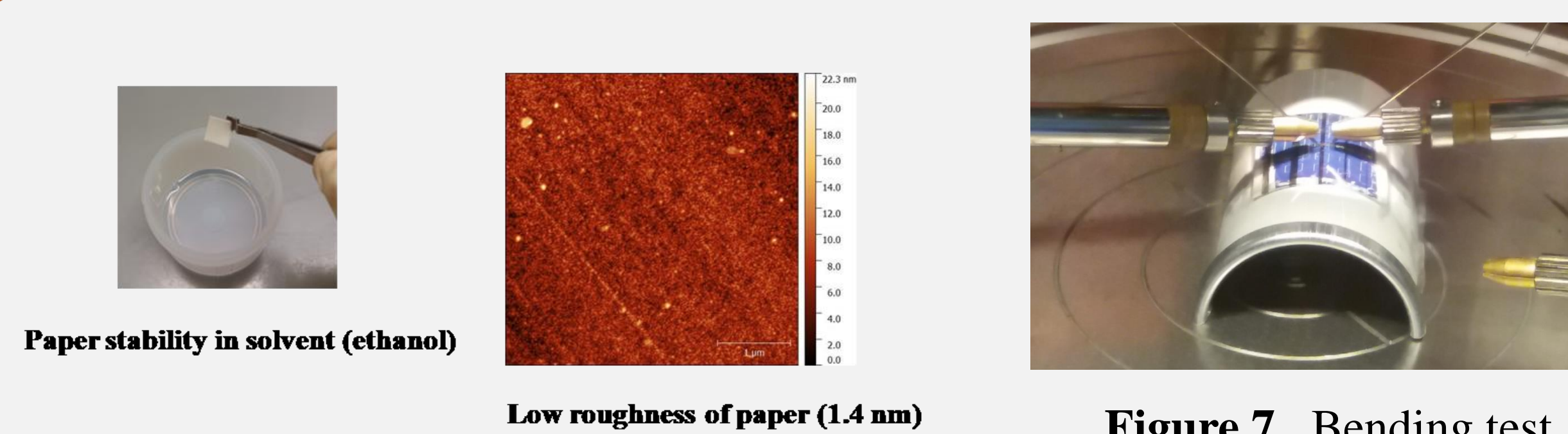
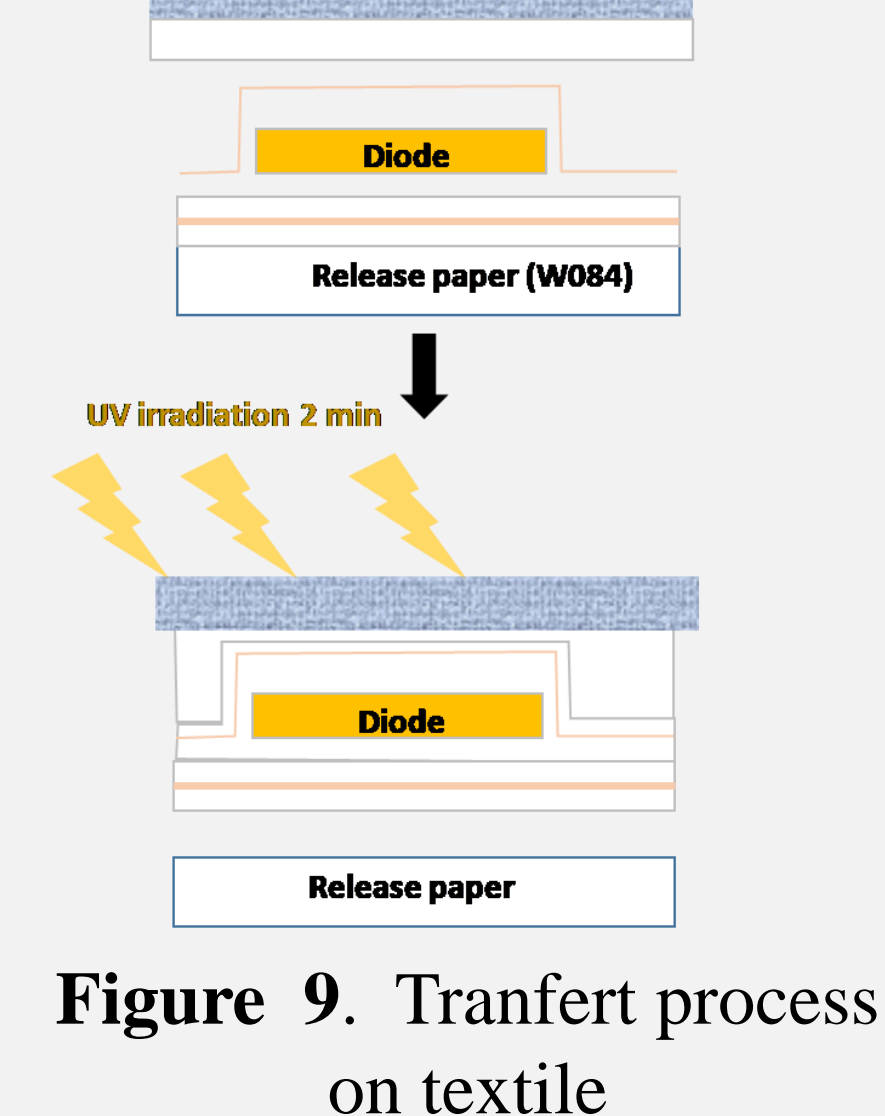


Figure 8. DC current density- voltage for diode in paper substrate

- High rectification ratio for flexible rectifier after bending (up to 10^6).



Conclusion

In this study, diodes with oligomers and polymers have been fabricated and characterized. With controlling different parameters of active layer deposition (thickness, polymer solvents) and by using SAM modification of gold electrode, we demonstrate that organic rectifiers with a high rectification ratio and very low turn on voltage can be obtained. Flexible pentacene diodes also show a high stability even after bending. The simulation shows that we can achieve a frequency response of about 0.15 at 2.4 GHz with a simple diode rectifier design. These components are suitable for RF energy harvesting.