Charge Transport through Molecules Supported by Flexible Electrodes

Victoria Quirós, Yuan Li

Department of Chemistry & Chemical Biology

Harvard University

Whitesides Research Group

Molecular electronics (MolEl)

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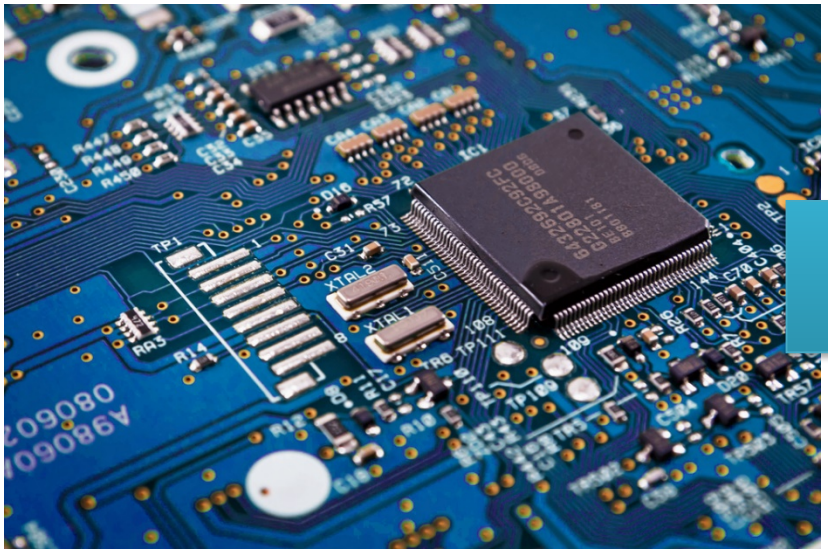
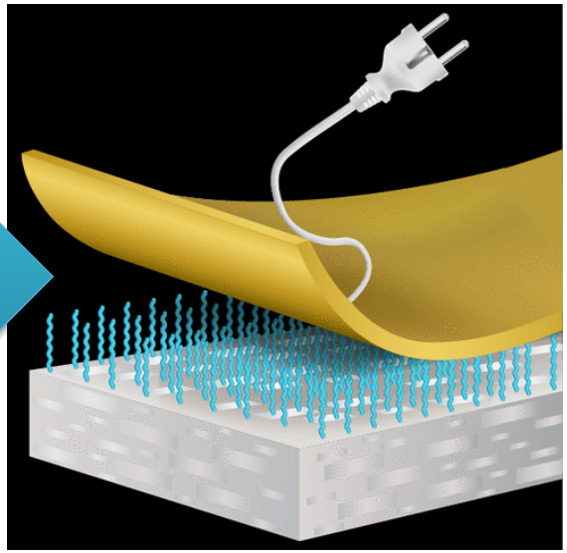
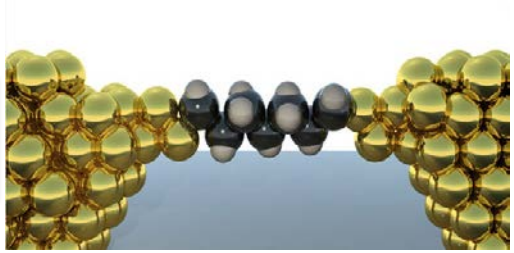
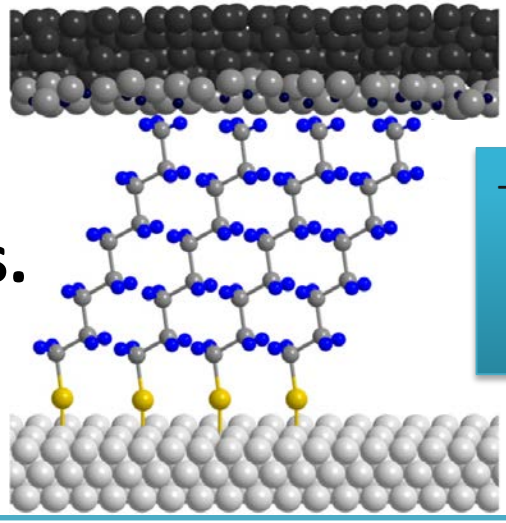




- Non-equilibrium state



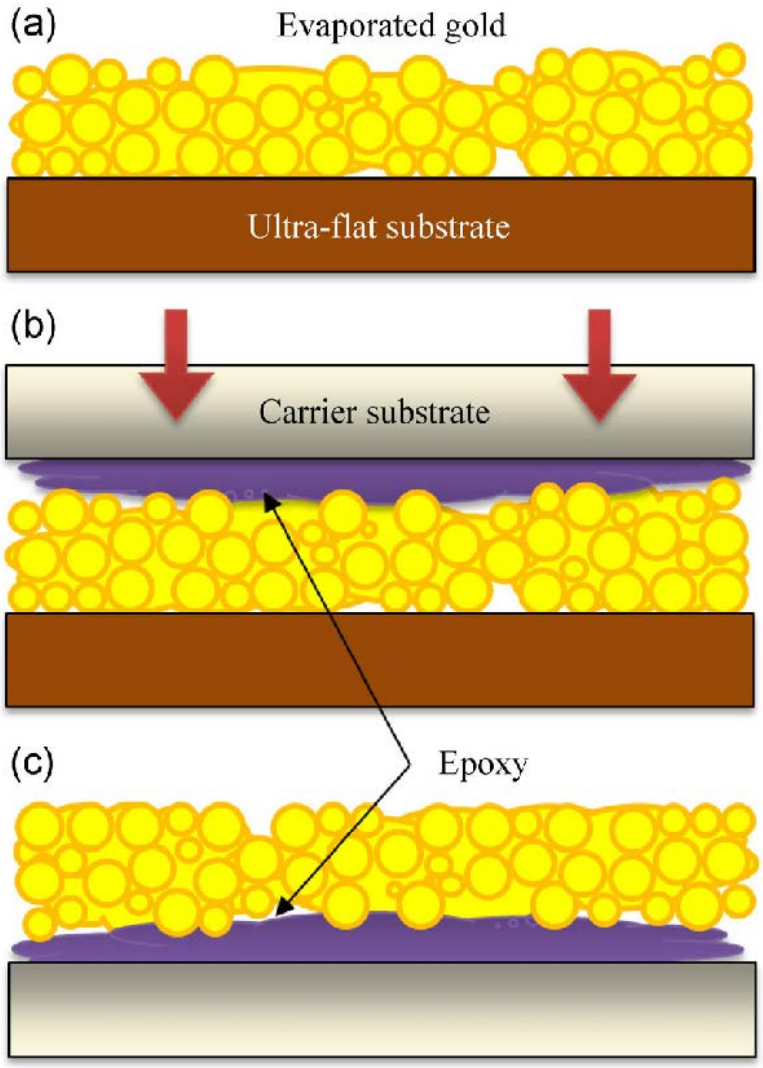
vs.



- Intrinsic stability
- Reproducibility
- Structural information

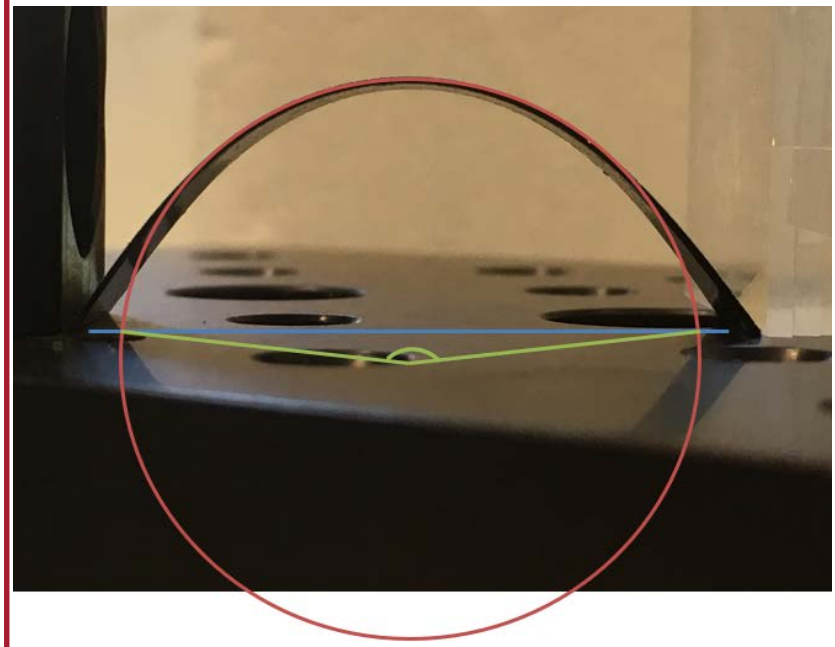
❖ Vilan A., Aswal D. and Cahen D. *Chem. Rev.* ***117***, 5 (2014)

Bottom-electrode



We used a silicon wafer as the ultra-flat substrate and polyamide (polymer) as the carrier substrate.

How is the bending angle of the bottom-electrode measured?



- M. E. Celestin, S. Krishnan, S. Bhansali, E. Stefanakos and D.Y. Goswami, *Nano Research* **7**, 5 (2014)

Self-assembled monolayer (SAM)

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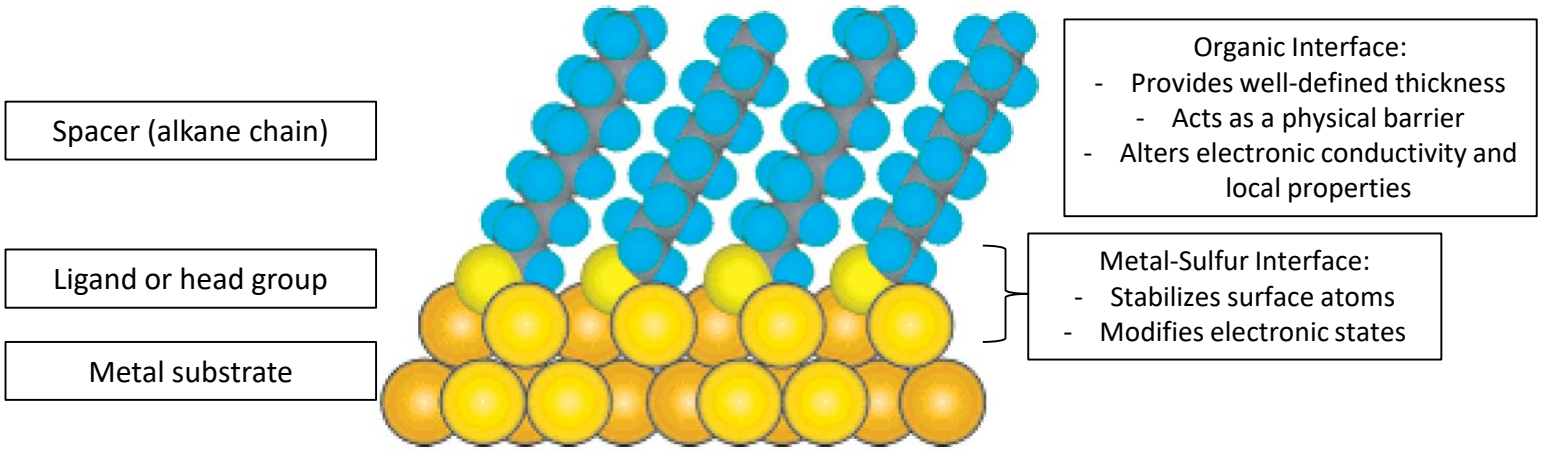

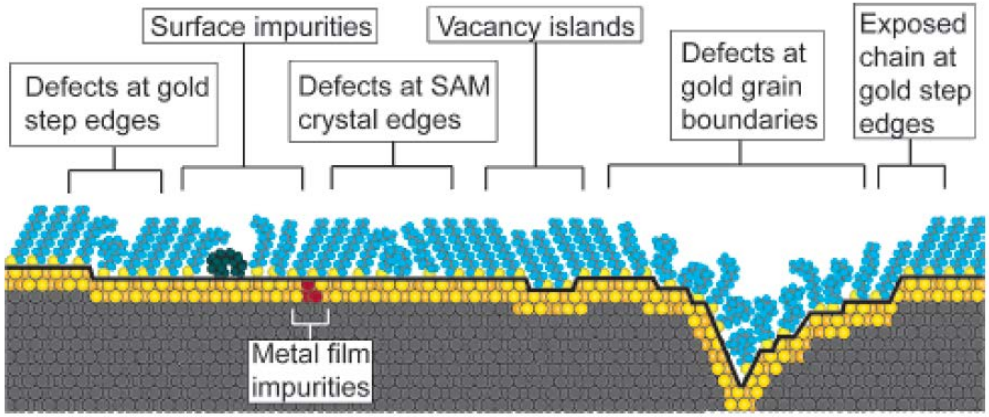

❖ J. C. Love, L. A. Estroff, J. K. Kriebel, R. G. Nuzzo, and G. M. Whitesides, *Chem. Rev.* **105**, 4 (2005)

Top-electrode

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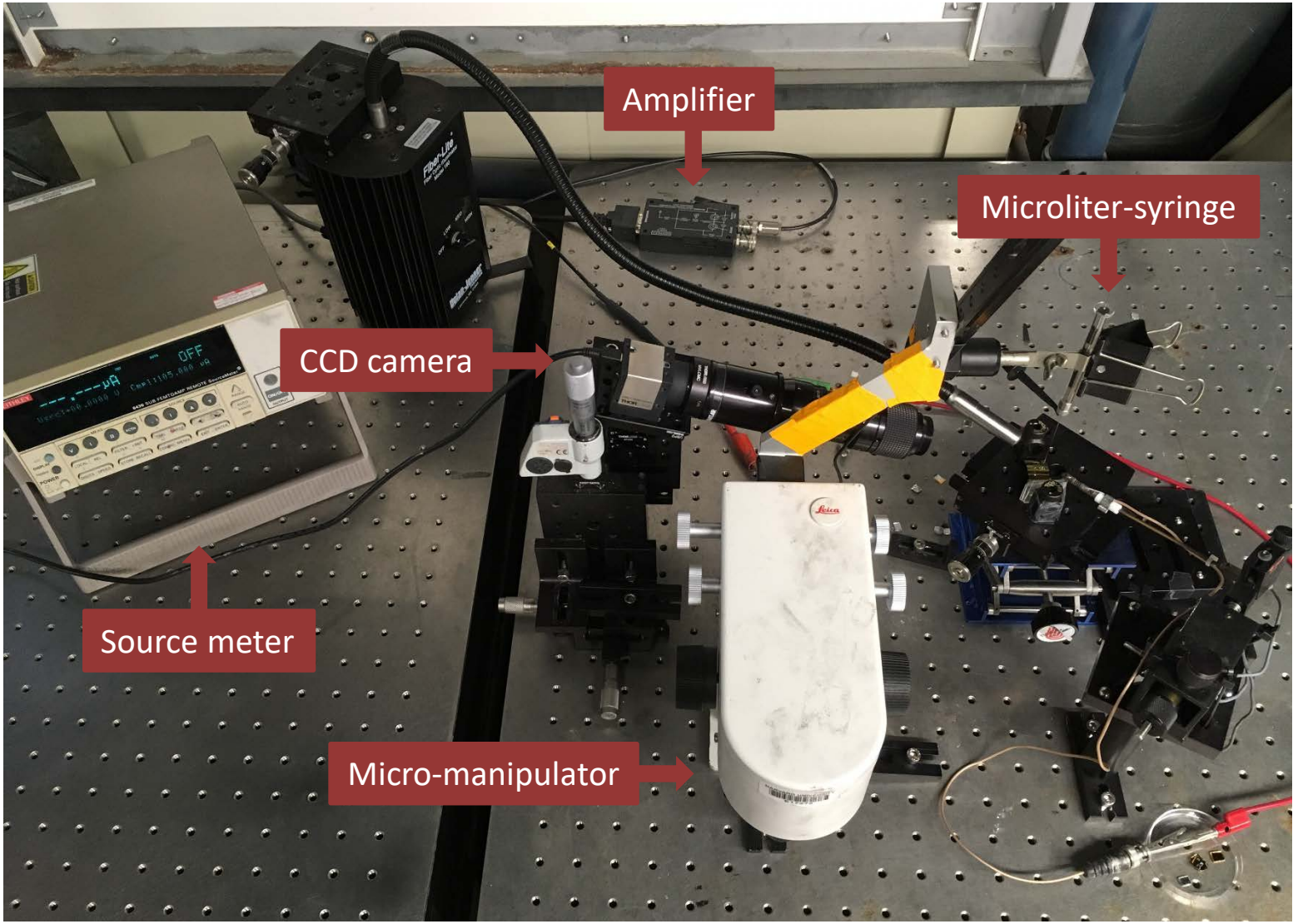
Home-built EGaIn setup



Top-electrode

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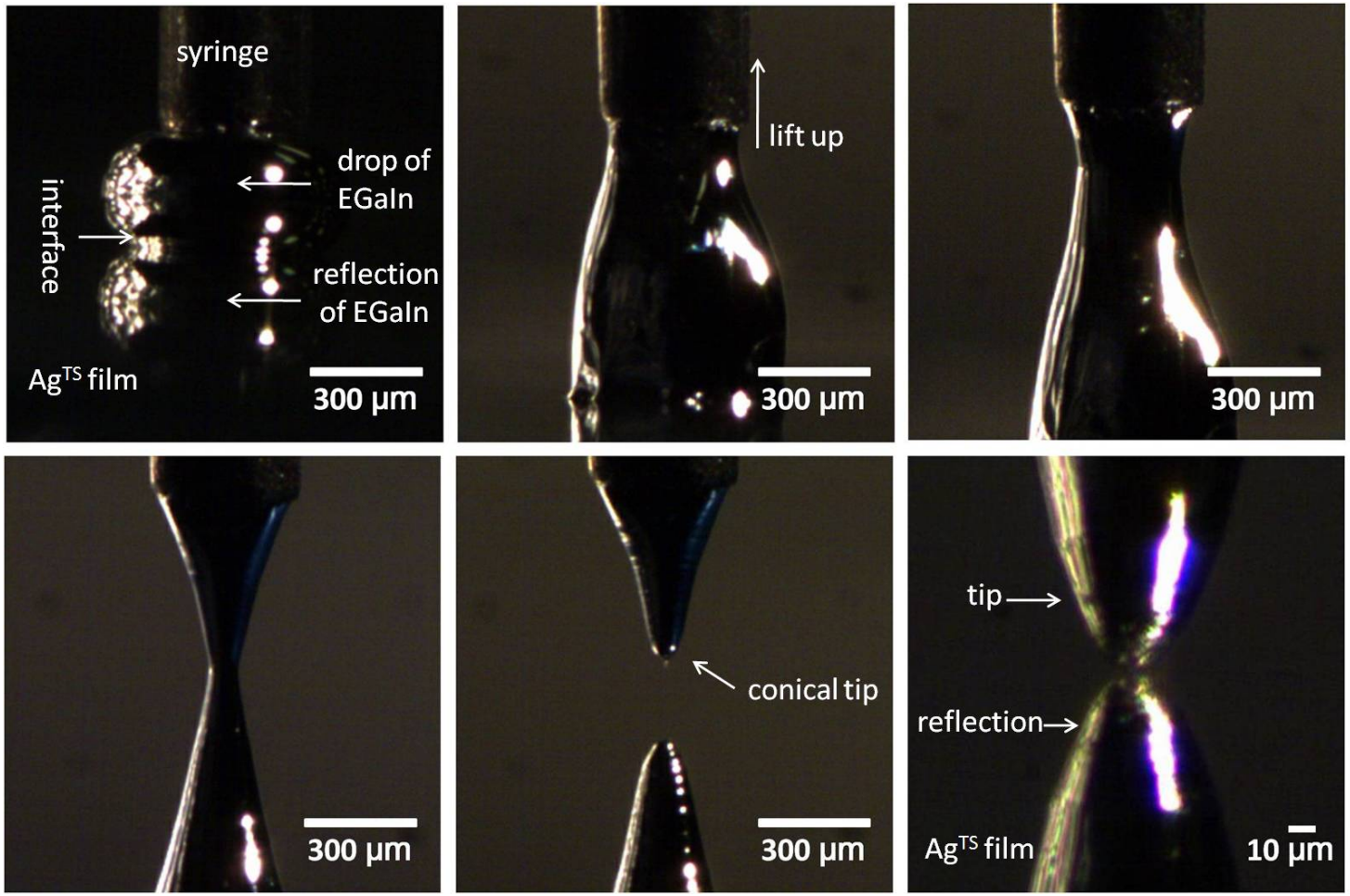
Preparation of the cone-shaped EGaIn top-contact

EGaIn: eutectic alloy of gallium (75.5%) and indium (24.5%), mp = 15.7ºC



❖ Chiechi et al. Angew. *Chem., Int. Ed.* **47**, 142 (2008)

SAM based junctions with liquid metal

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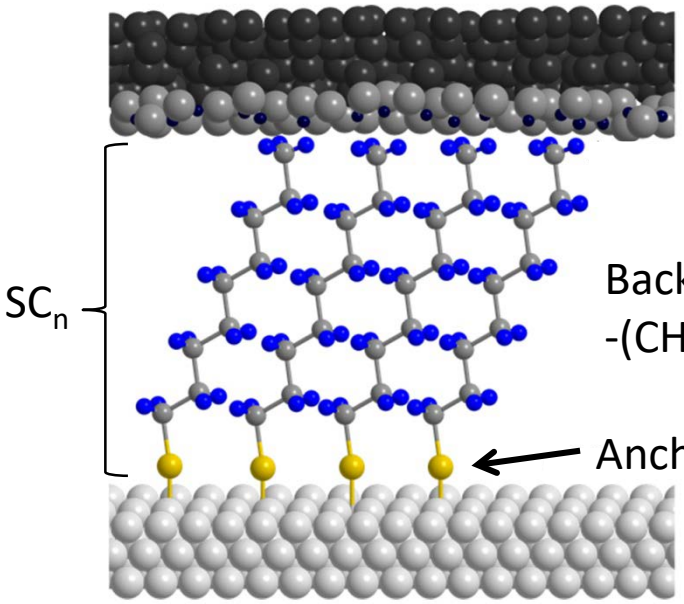
SC_n SAM as standard platform (SC_n: n-alkanethiol)

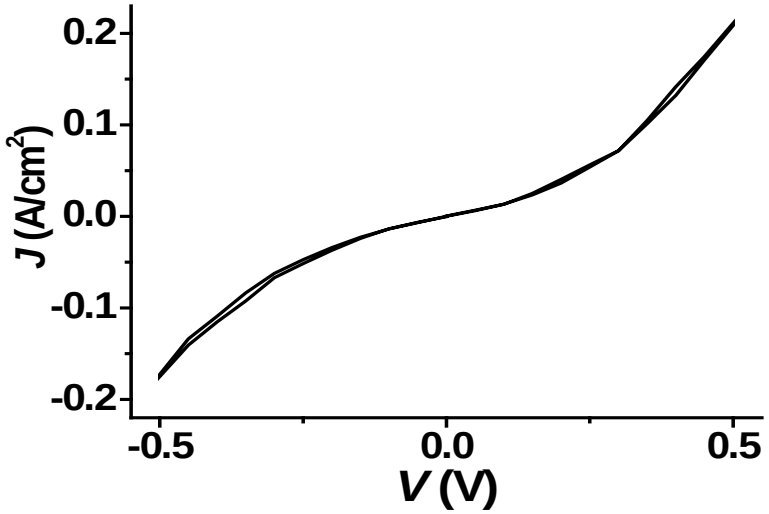
Top-electrode: EGaIn

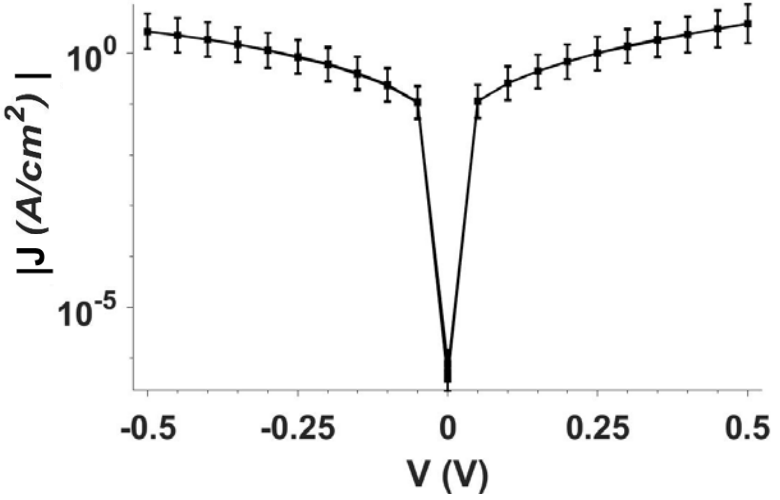


Bottom electrode: Au

Typical *J*(V) curve

J: Current density
(current divided by contact area)





J(V) measurements of junctions with SC_{10} SAMs

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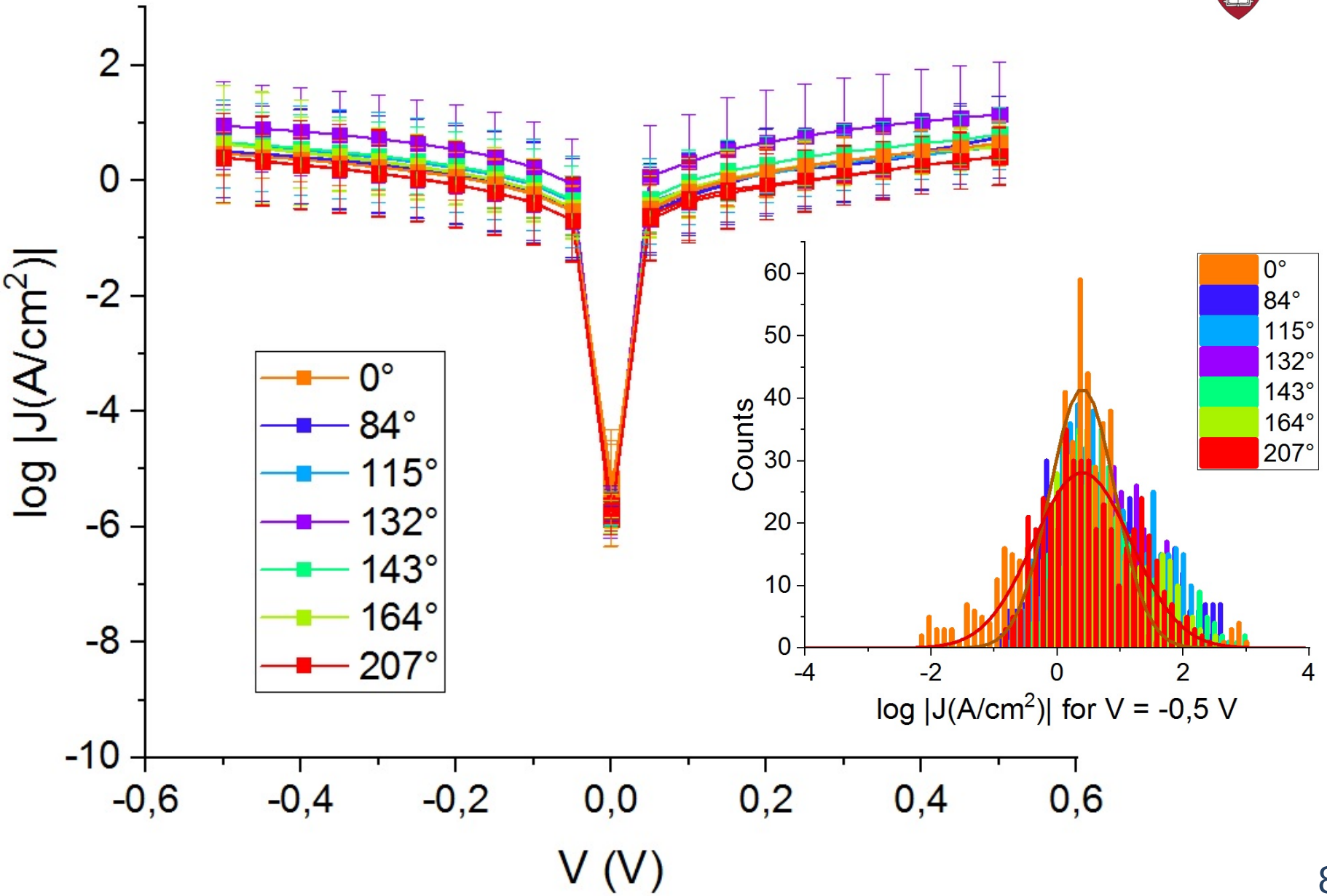

J(V) measurements of junctions with SC_{14} SAMs

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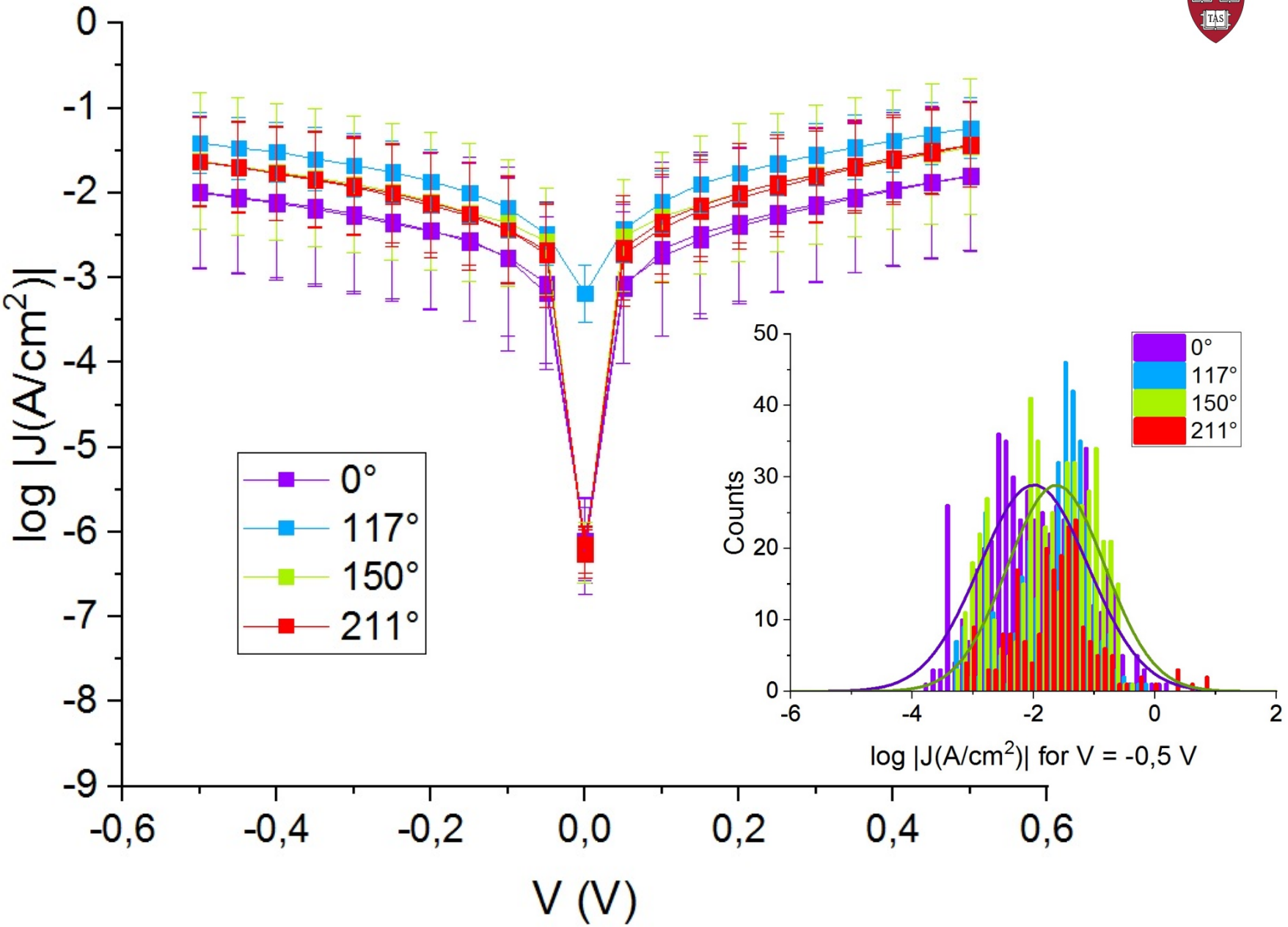

J(V, α) measurements for V = -0,5 V

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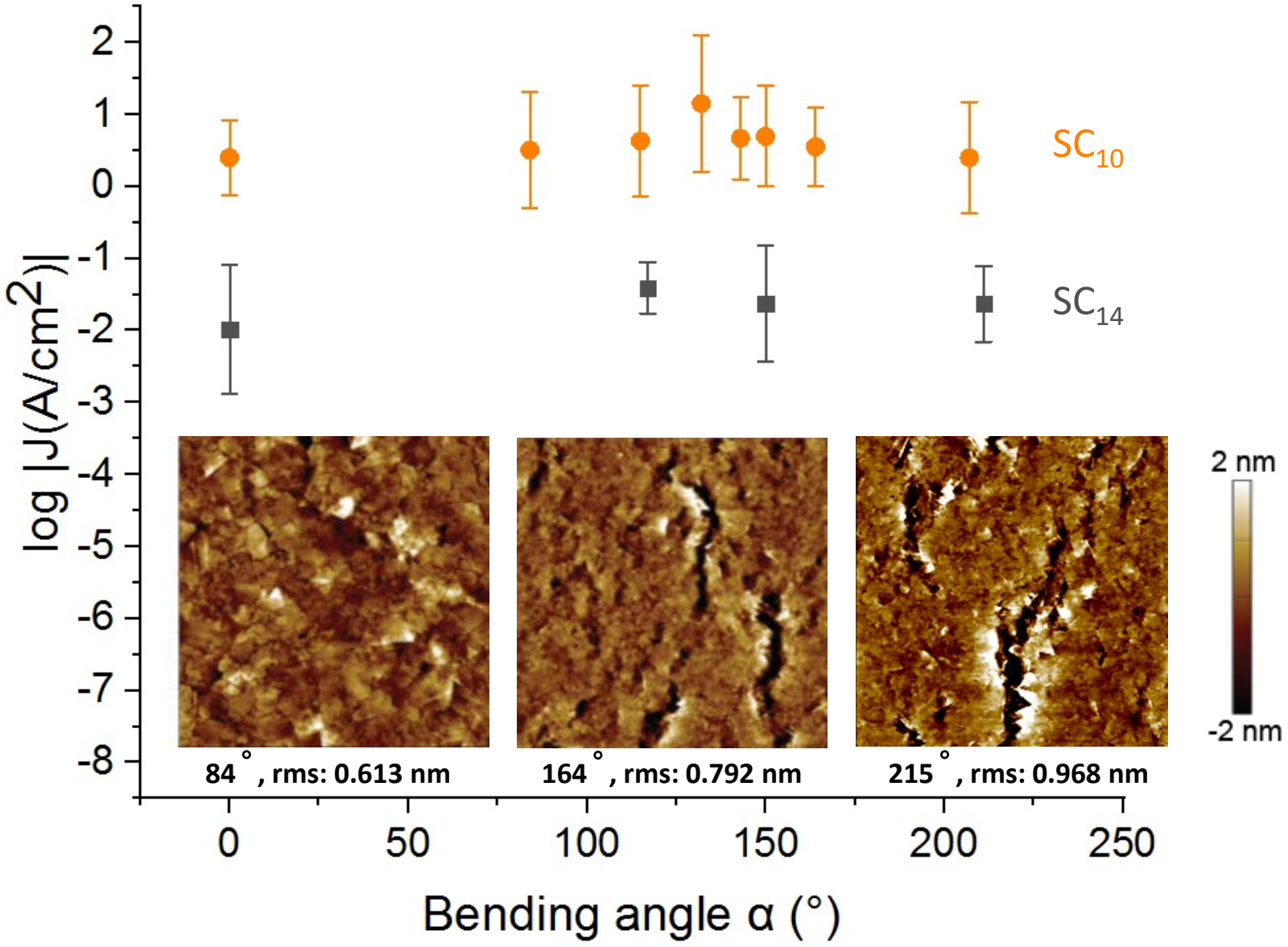

Conclusions and future experiments

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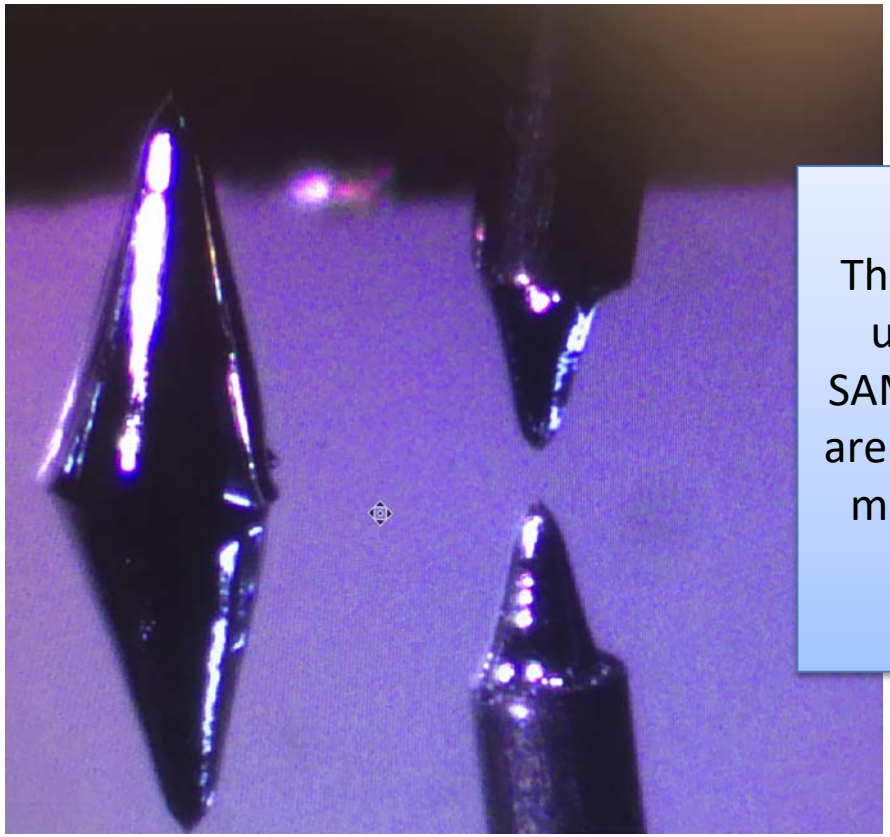
The SAM-based junctions built are robust. The tunneling current doesn't change even when large deep valleys form in the bottom-electrode for bending angles $\alpha > 150°$ due to tensile stress.



The experiment should be repeated using junctions with SC_{18} and SC_6 SAMs to determine if these junctions are robust when they comprise SAMs made up of other molecules of the series of n-alkanethiols.

Acknowledgements

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