ADVANCED ENERGY MATERIALS

Supporting Information

for *Adv. Energy Mater.,* DOI: 10.1002/aenm.201902883

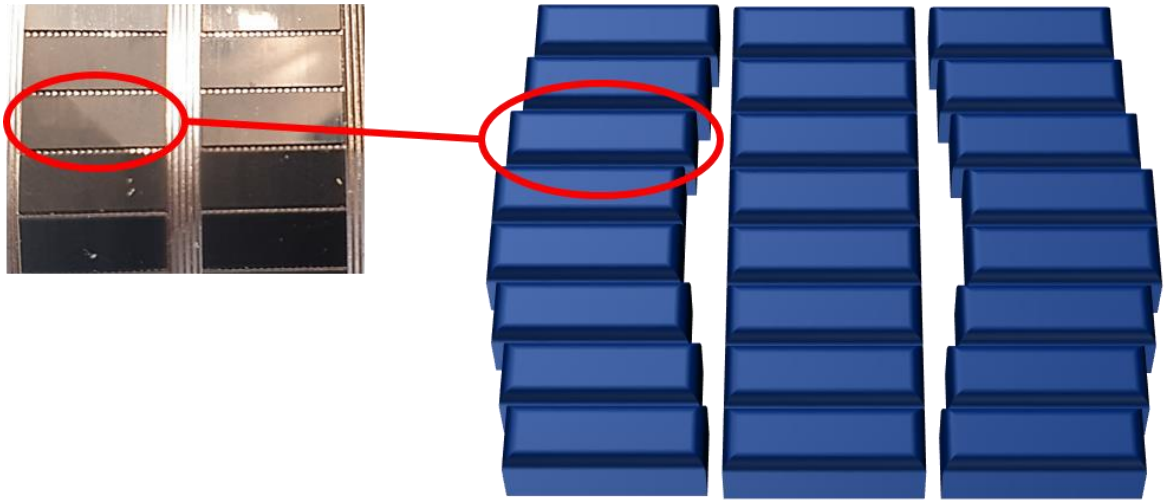
Corrugation Enabled Asymmetrically Ultrastretchable (95%) Monocrystalline Silicon Solar Cells with High Efficiency (19%)

*Nazek El-Atab, Nadeem Qaiser, Rabab Bahabry, and Muhammad Mustafa Hussain**

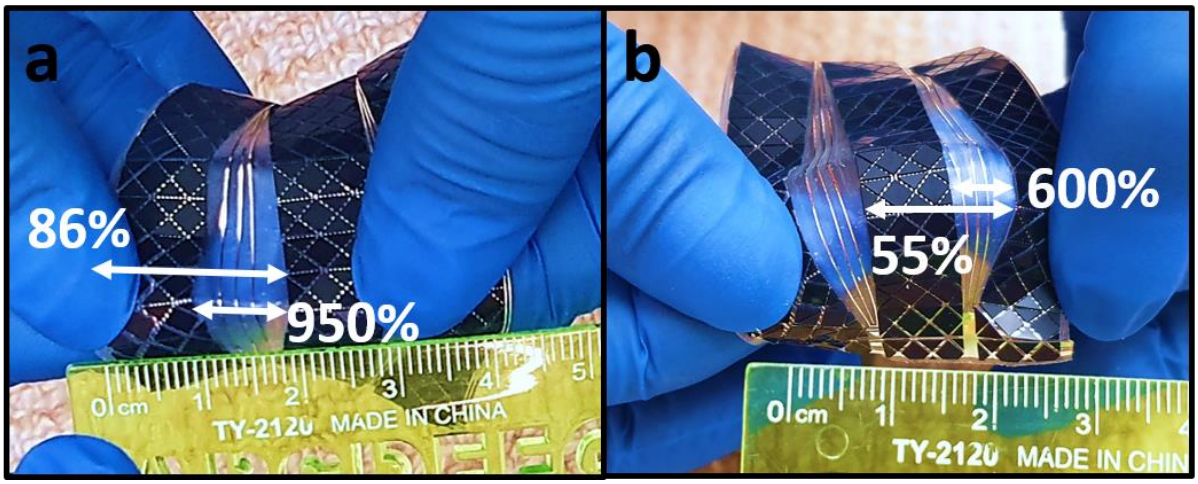
Supporting Information

Corrugation Enabled Asymmetrically Ultra-Stretchable (95%) Monocrystalline Silicon Solar Cells with High Efficiency (19%)

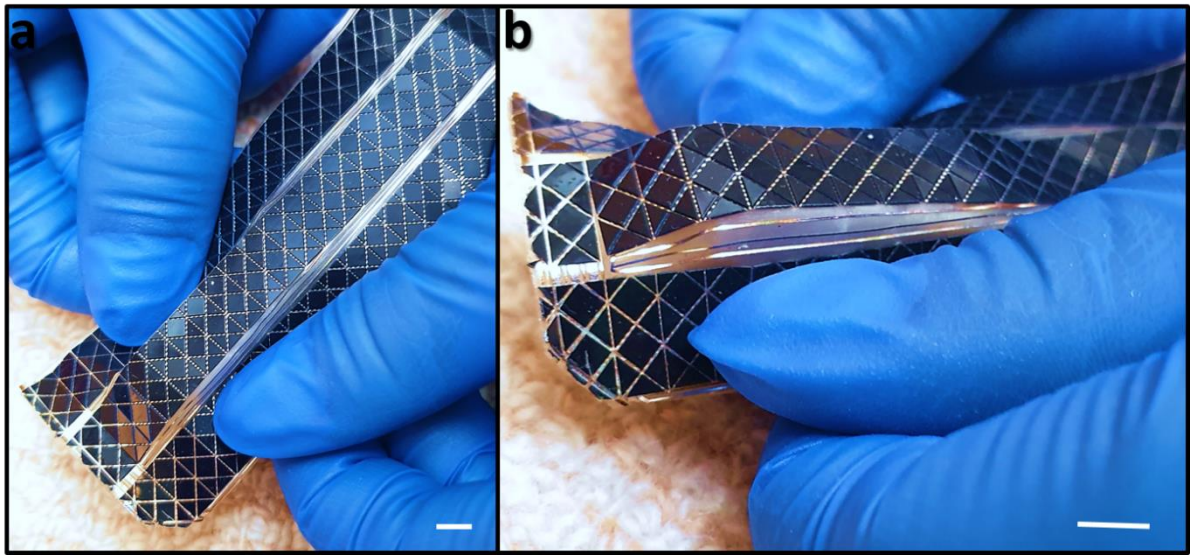
*Nazek El-Atab, N. Qaiser, R. Bahabry and Muhammad Mustafa Hussain**



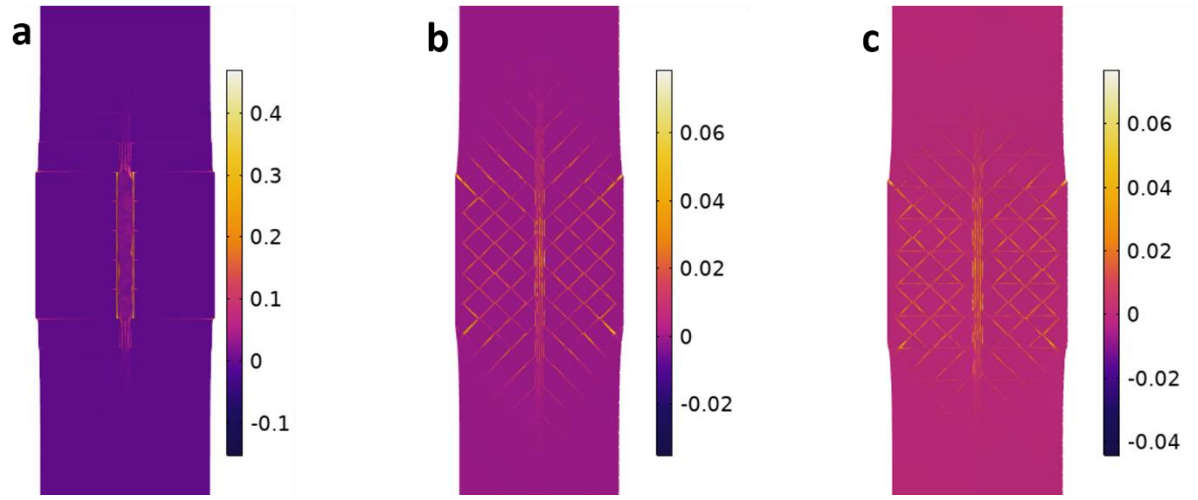
Supplementary Figure 1. Asymmetrical stretching of the linear corrugated solar cells leads to a compressive strain generation in the surrounding islands. As a result, a diagonal crack in the silicon island is observed.



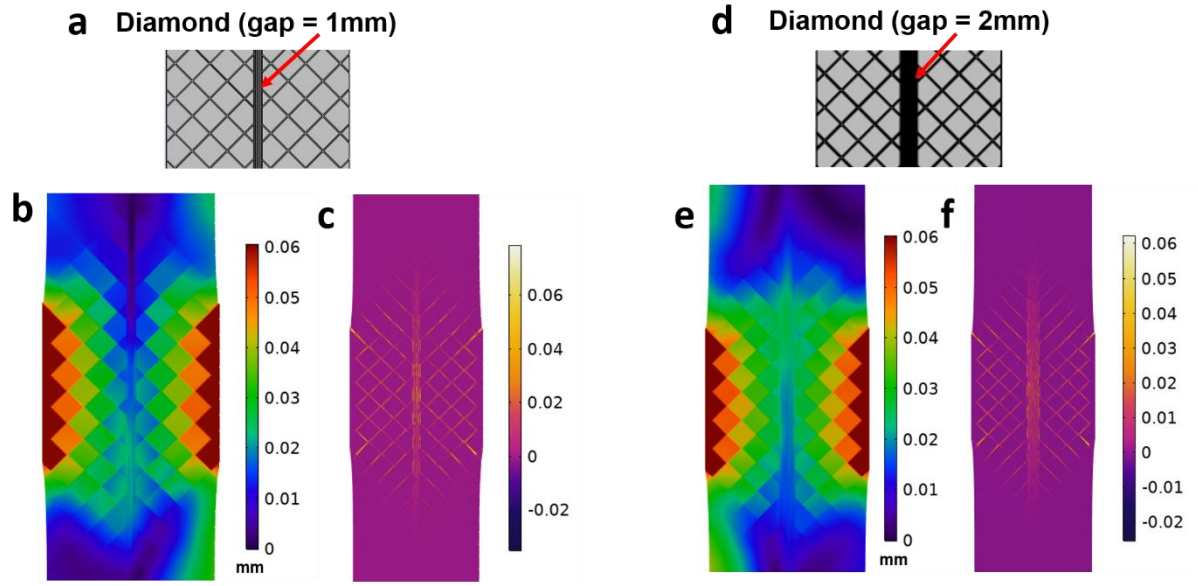
Supplementary Figure 2. Asymmetrical stretching of the triangular corrugated solar cells with 1 mm spacing at different positions from the positive/negative terminals a) stretchability at 2.5 cm from the terminal, b) stretchability at 1.5 cm from the terminal.



Supplementary Figure 3. Out-of-plane stretching of the triangular corrugated solar cells close to the positive/negative terminal, a) top view, b) side view. Scale bar is 6 mm.



Supplementary Figure 4. Strain contours simulated using COMSOL in the different patterned stretchable solar cells a) Linear patterned, b) Diamond patterned, c) Triangular patterned solar cells. The linear distribution has 85% higher strain compared to the diamond and triangular designs.



Supplementary Figure 5. The effect of the spacing between the rigid islands on the deformation and strain contours is studied using COMSOL simulations. a) Simulated structure showing diamond patterned cells with 1 mm spacing, b) Simulated deformation contour in the struture shown in Figure S3a, c) Simulated strain contour in the struture shown in Figure S3a, d) Simulated structure showing diamond patterned cells with 2 mm

spacing, e) Simulated deformation contour in the struture shown in Figure S3d, f) Simulated strain contour in the struture shown in Figure S3d. Larger spacings result in larger deformations and lower strains due to the additional elastomer free area.

Supplementary video 1. Stretching of the linear corrugated solar cell with 2 mm spacing.

Supplementary video 2. Out-of-plane stretching and wrapping of the linear corrugated solar cell with 2 mm spacing around a spherical object.

Supplementary video 3. Out-of-plane stretching of the triangular corrugated solar cell with 1 mm spacing around a joint (knee).