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Synthesis and characterization of cube like structured lead sulfide as a counter electrode in the presence of urea using hydrothermal method

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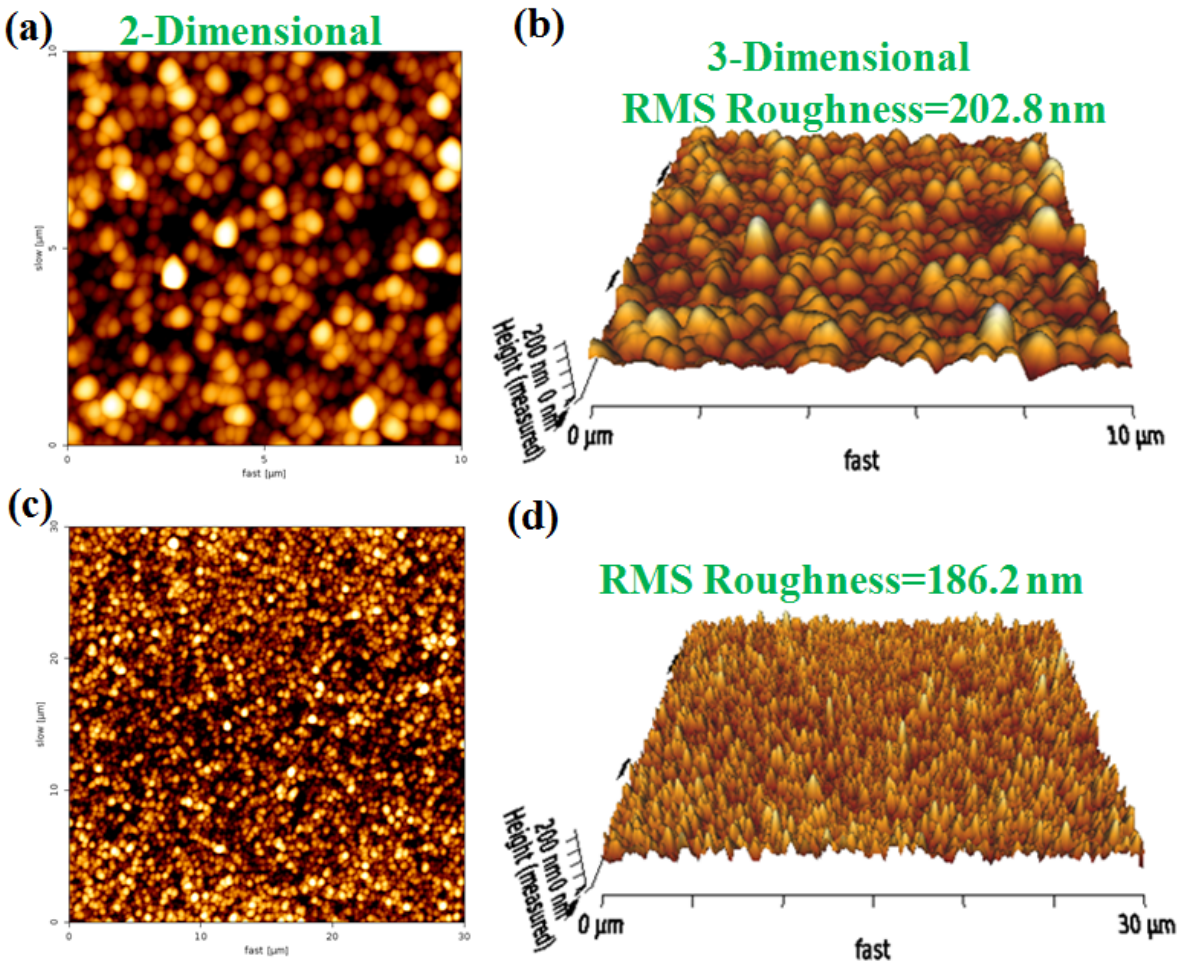

Fig. S1 AFM images of the PbS (0.6 M urea, Fig. a and b), and 0.9 M urea (Figure (c) and (d))

electrodes. The left one corresponds to 2D and the right ones correspond to 3D images.

The root mean square (RMS) surface roughness of the 0.6 M urea and 0.9 M urea are 202.8 and 186.2 nm, which is lower than that of the 0.3 M urea (269.8 nm) and 0 M urea (217.8 nm). The AFM results clearly support that the greater surface roughness or surface area of the CE is responsible for the greater electrocatalytic activity for the reduction.

Calculation of fill factor (FF) and power conversion efficiency (PCE)

The FF of a QDSSCs can be calculated as follows:

$$FF = Imp\ Vmp/Isc\ Voc \qquad (1)$$

Where Imp and Vmp are the maximum current and voltage, and Isc, Voc are the short-circuit current and open-circuit voltage.

The PCE of a QDSSCs is determined as the fraction of incident power which is converted to electricity and can be calculated as follows:

$$PCE = Voc\ Isc\ FF/Pin \qquad (2)$$

Where Pin is the power of incident light on the cell. The detailed calculation of FF and PCE was reported in the previous reports.[1]

References

1 O. O. Kelvin and Ekpunobi, *Advances in Applied Science Research*, 2013, **3(5)**, 3390.