Metal insulator semiconductor solar cell devices based on a Cu2O substrate utilizing h-BN as an insulating and passivating layer

Onur Ergen,1,2,3 Ashley Gibb,1,2,3 Oscar Vazquez-Mena,1,2,3 William Raymond Regan,1,2 and Alex Zettl1,2,3

1Department of Physics, University of California at Berkeley, Berkeley, California 94720, USA
2Materials Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA
3Kavli Energy Nanosciences Institute at the University of California, Berkeley, and the Lawrence Berkeley
National Laboratory, Berkeley, California 94720, USA

We demonstrate cuprous oxide (Cu2O) based metal insulator semiconductor Schottky (MIS-Schottky) solar cells with efficiency exceeding 3%. A unique direct growth technique is employed in the fabrication, and hexagonal boron nitride (h-BN) serves simultaneously as a passivation and insulation layer on the active Cu2O layer. The devices are the most efficient of any Cu2O based MIS-Schottky solar cells reported to date.