

Electronic Supplementary Information for

Heteroepitaxial film silicon solar cell grown on Ni-W foils

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Numerical method for determining % cube of a cube-textured material

A (111) pole figure of a cube-textured material has four peaks:

$$\psi_1 = 54.7^\circ, \phi_1 = 45^\circ$$

$$\psi_2 = 54.7^\circ, \phi_2 = 135^\circ$$

$$\psi_3 = 54.7^\circ, \phi_3 = 225^\circ$$

$$\psi_4 = 54.7^\circ, \phi_4 = 315^\circ$$

The total intensity in a pole figure is

$$I_{\text{total}} = \int_0^{\pi/2} d\psi \int_0^{\pi/2} d\phi \sin \psi I(\psi, \phi).$$

The cube-textured intensity is

$$I_{\text{cube}} = \sum_{i=1}^4 \int_0^{\pi/2} d\psi \int_0^{\pi/2} d\phi \sin \psi I(\psi, \phi) N(\psi - \psi_i, \phi - \phi_i),$$

where,

$$N(\Delta\psi, \Delta\phi) = 1 \text{ if } \sqrt{\Delta\psi^2 + \Delta\phi^2} < W$$

$$N(\Delta\psi, \Delta\phi) = 0 \text{ otherwise.}$$

We set $W = 15^\circ$.

The cube fraction is $I_{\text{cube}}/I_{\text{total}} \times 100$ (%).

Table S1. Lattice mismatches between layers with and without 45° rotation of basal plane.

Interface	ϵ_s without rotation	ϵ_s with rotation	Experimental rotation
NiW/Y ₂ O ₃	50.4%	6.4%	45°
Y ₂ O ₃ /YSZ	2.9%	31.3%	None
YSZ/CeO ₂	5.1%	25.7%	None
CeO ₂ /STO	27.8%	2.1%	45°
STO/ γ -Al ₂ O ₃	1.7%	43.9%	None
γ -Al ₂ O ₃ /Si	36.7%	3.3%	45°

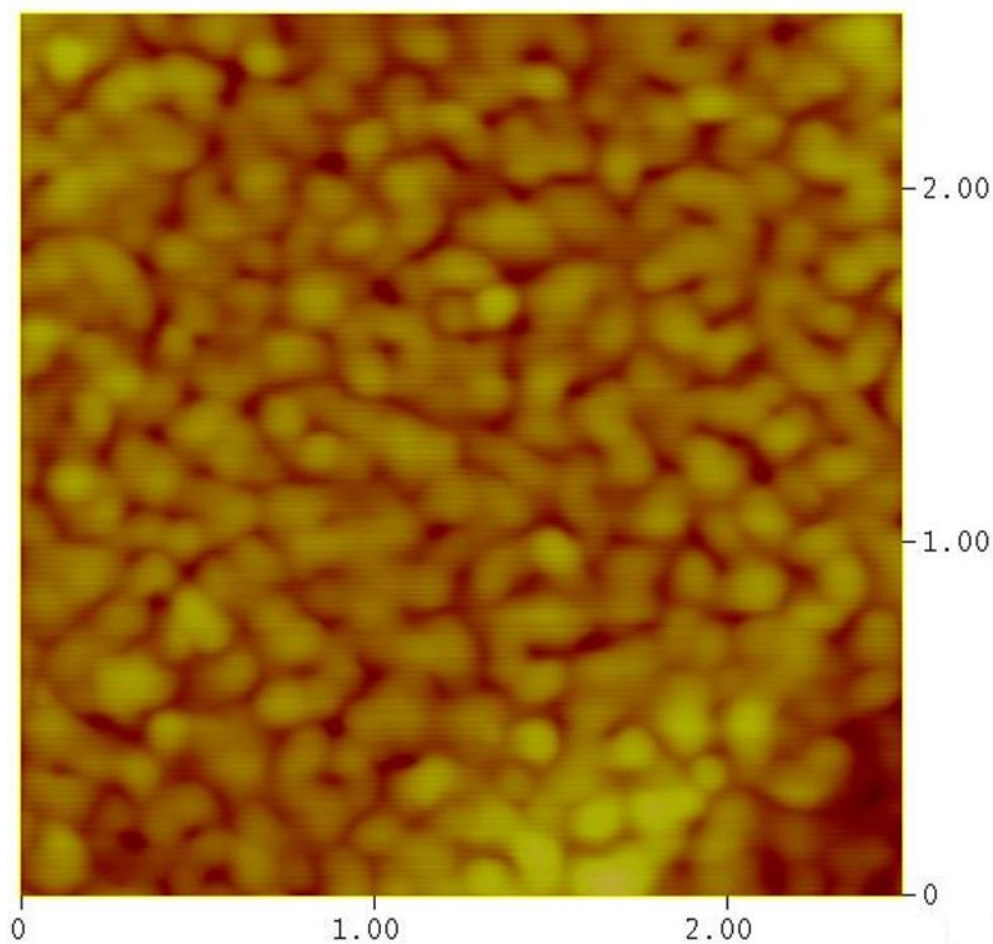


Figure S1. AFM image ($2.5 \times 2.5 \mu\text{m}^2$) for $\gamma\text{-Al}_2\text{O}_3$ top layer (100 nm) on STO (100 nm) / CeO_2 (60 nm) / YSZ (100 nm) / Y_2O_3 (80 nm) / Ni-5 at.% W (50 μm). The RMS surface roughness is measured to have 3.26 nm.