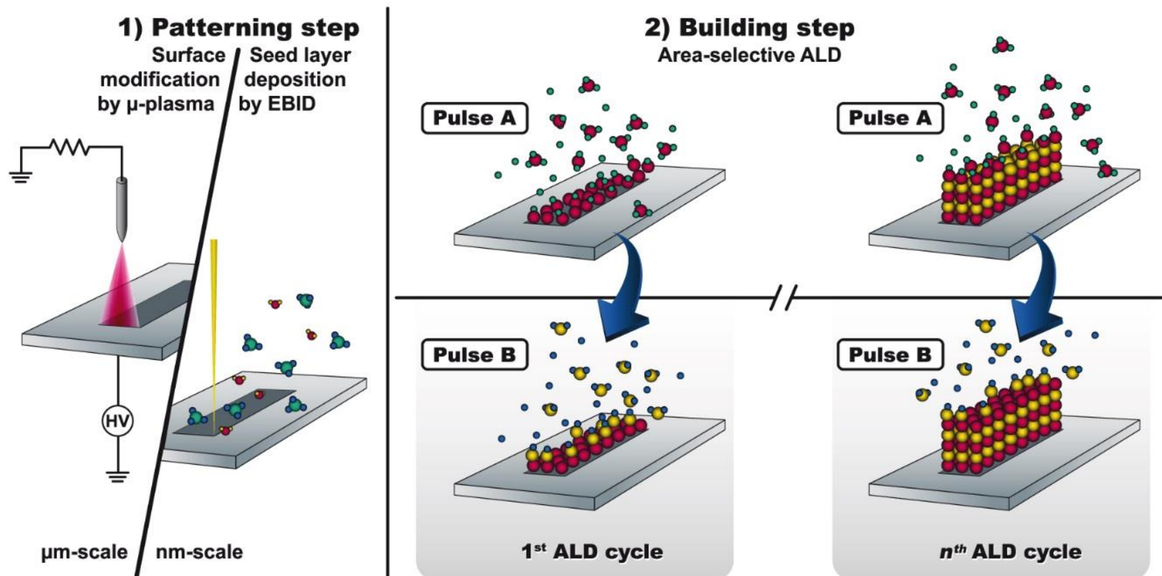

Figure 1: Schematic representation of the *direct write* ALD process of In_2O_3:H and ZnO on H-terminated silicon materials. In the first step (1) microscale patterns are defined by activating the surface with a µ-plasma operated in air or O_2. Alternatively, nanoscale patterns are defined by depositing a SiO_2 seed layer using EBID. In the second step (2) the TCO material of choice is deposited selectively on the activated areas in a building step by AS-ALD. The ALD process consists of two alternating half reactions: precursor dosing in pulse A and co-reactant dosing in pulse B.

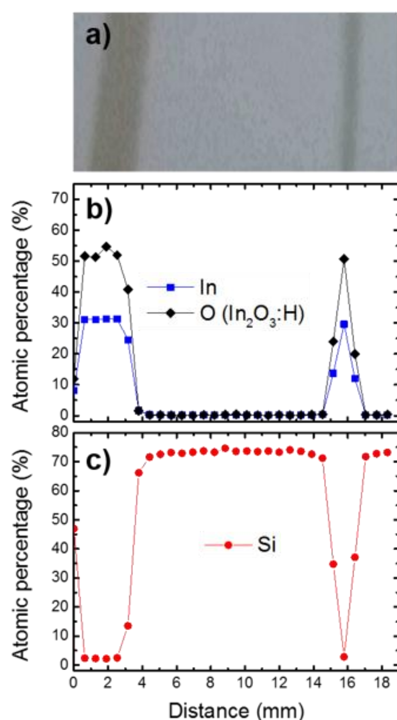

Figure 2: *a)* Photograph of In_2O_3:H lines being 3000, 800, 600 µm wide as prepared by the *direct-write* ALD process using the µ-plasma activation step and 400 AS-ALD cycles of In_2O_3:H. *b) and c)* XPS line scans of the sample surface.

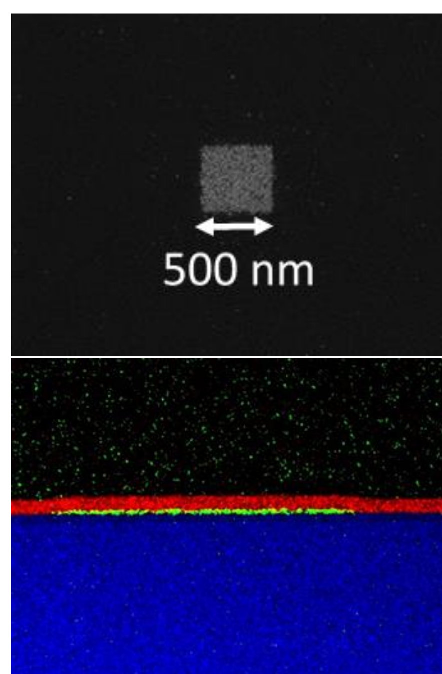

Figure 3: *a)* SEM image of ZnO pads (500 x 500 nm²) as prepared by *direct-write* ALD using the EBID activation step and 80 AS-ALD cycles of ZnO. *b)* Cross-sectional EDX mapping performed during TEM analysis of the pattern.