

Supplementary Pages

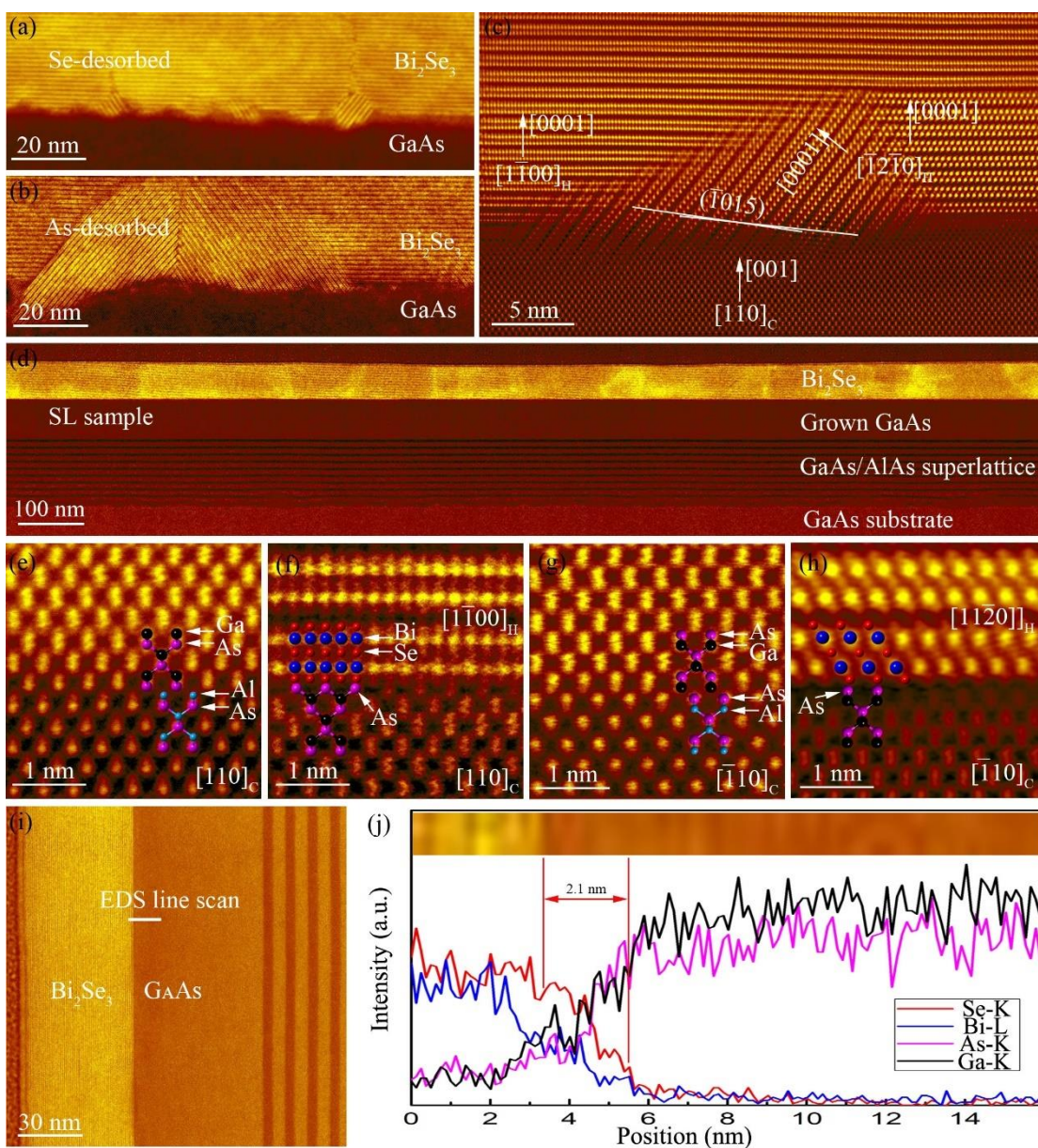


Figure 1. Cross-sectional HAADF-STEM characterization. (a, b) HAADF-STEM images taken along the GaAs [110]_C zone-axis showing the rough interface of Bi₂Se₃/GaAs in the Se-desorbed and As-desorbed samples, respectively. (c) Zoom-in atomic resolution image showing (0001)_H oriented growth of [1100]_H and [1210]_H Bi₂Se₃ domains on flat GaAs (001)_C substrate, and (1015)_H oriented growth of [1210]_H Bi₂Se₃ domain on multi-faceted rough GaAs substrate. (d) Large-scale image demonstrating the flat interface of Bi₂Se₃/GaAs in the SL sample. (e-h) Zoom-in images overlapped with atomic models showing the

dumbbell atomic structure of the GaAs/AlAs superlattice in (e, g), and the atomically smooth interface of Bi₂Se₃/GaAs terminated by As-site (f, h) in the GaAs surface, respectively. (i) Rotated image showing the STEM-EDS line-scan analysis region. (j) Line-profiles of chemical compositions across the Bi₂Se₃/GaAs interface. False colors are added in the images to aid the eye.