Electronic Supplementary Material (ESI) for RSC Advances.

Assessment of Wafer Scale MoS_2 Atomic Layers Grown by Metal-Organic Chemical Vapor Deposition Using Organo-metal, Organo-sulfide, and H_2S Precursors

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Supplementary Information

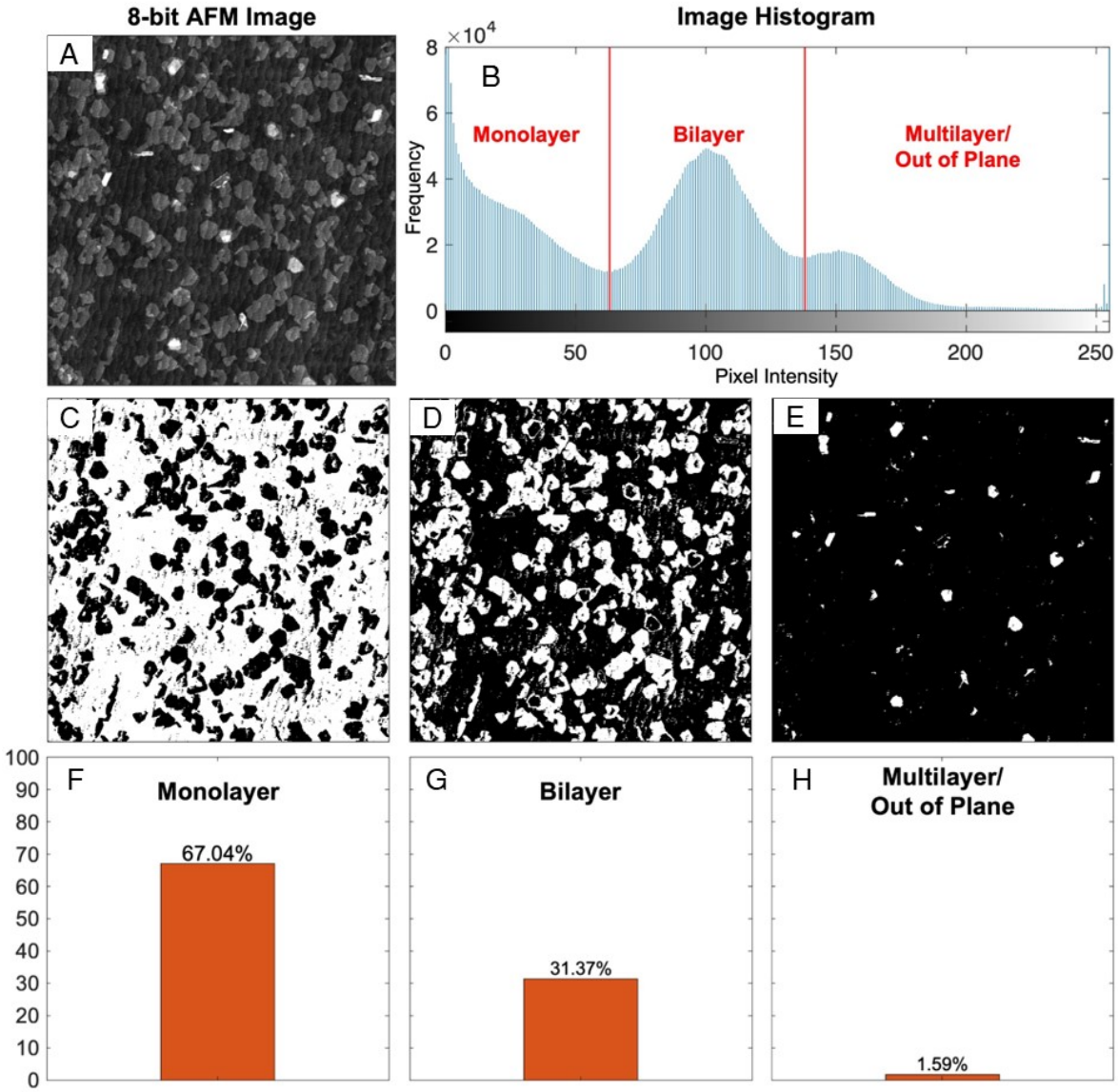

Figure 1. Output from image processing script used to analyze layer coverage. Monolayer coalescence is confirmed with Raman spectroscopy. Based on the assumption of the monolayer base, additional domains are bi-multilayer coverages. A: Cropped AFM input image. B: Pixel intensity histogram of input image. C-E: Threshold regions, white pixels count towards region percentage. F-H: Pixel count percentages by coverage type.

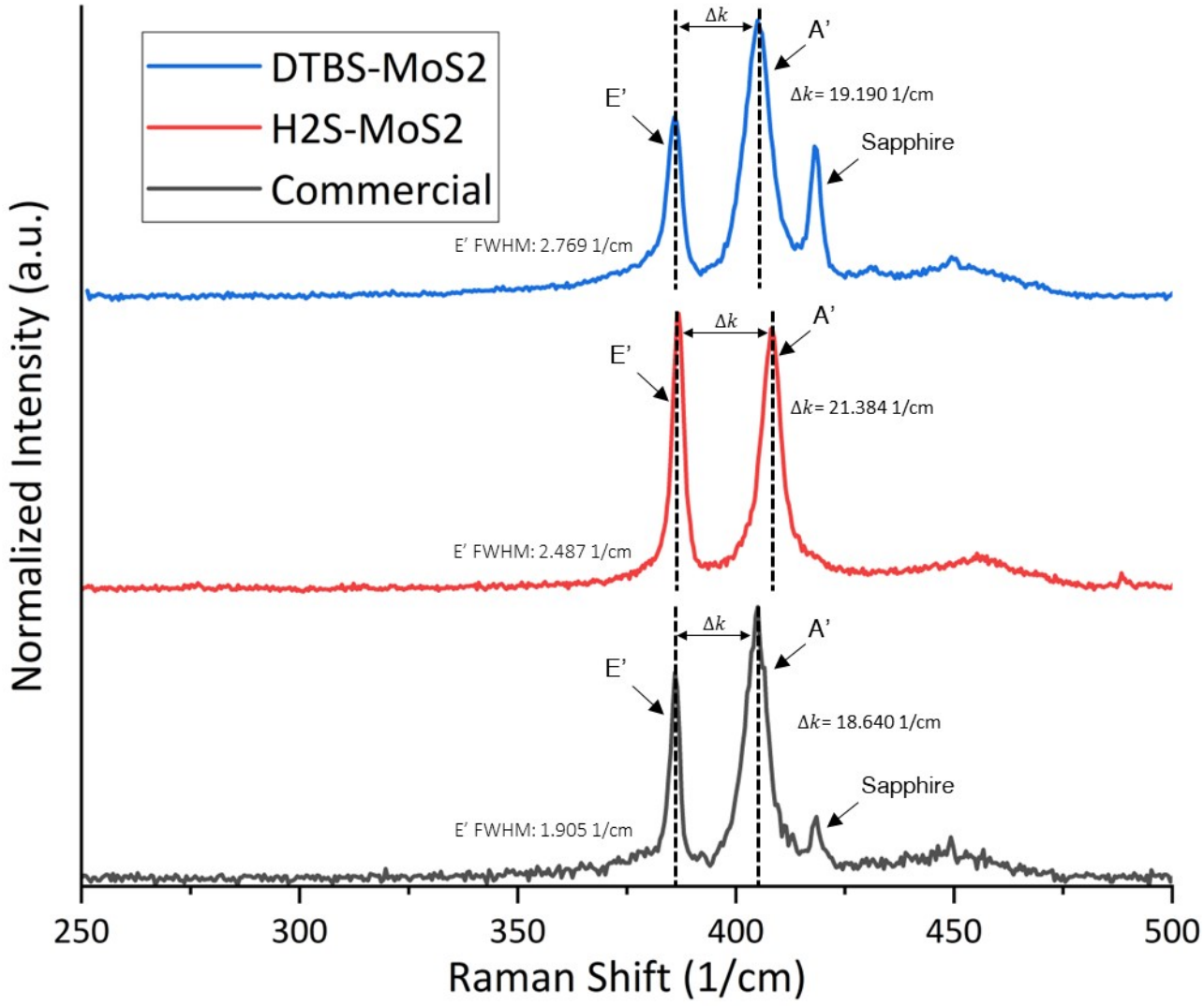

Figure 2. Comparison of Raman spectra MOCVD grown samples to commercially available MoS_2. For both experimental samples, a random spectrum was chosen from the top quartile of the 400 spectra maps rank ordered by in-plane FWHM. The FWHM of the in-plane Raman mode on the commercially available sample is noticeably smaller than that of the H_2S or DTBS-grown samples. The primary peak separation of DTBS-grown sample is closer to the value from the commercial sample, due to its decreased bilayer.

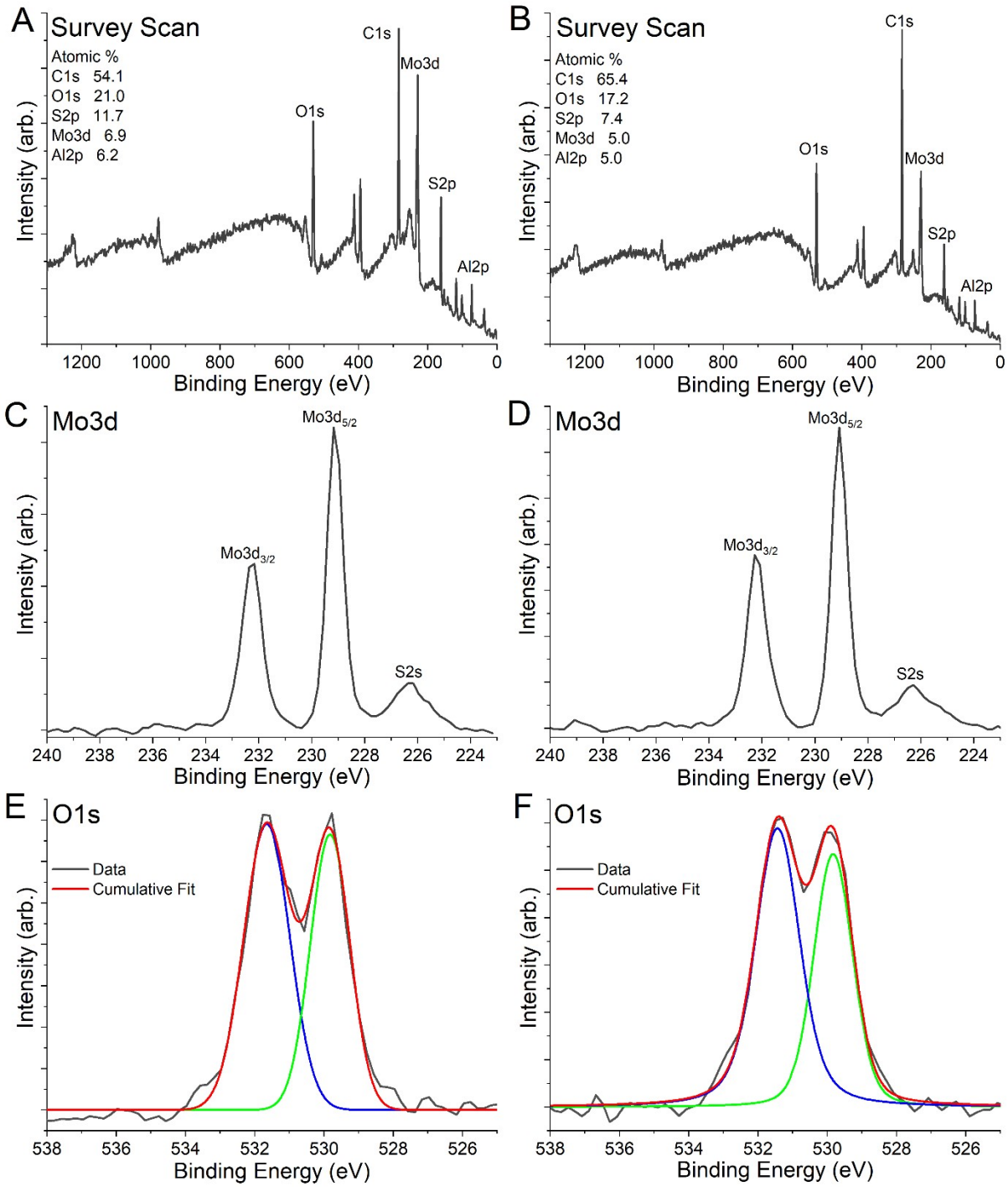

Figure 3. XPS spectra of MoS2 samples grown use the H_2S process (1st column: A, C, & E) and the DTBS process (2nd column: B, D, & F). A-B: XPS survey scan data from each sample with the associated atomic concentrations. As the MoS2 samples are atomically thin, spectra includes elements from the substrate (sapphire). Samples from the H_2S process (1st column) show considerably less carbon species retained from the precursors. While the samples contain a significant quantity of oxygen, oxygen species are related to the sapphire substrate and retained carbonyl species (E-F).