Process-accompanying analysis of solid intermediate and end products in the manufacturing process of high-purity tungsten by ETV-ICP-OES

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Electronic supplementary information (ESI)

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Part I – Wavelength vs. intensity plots for all elements and sample types

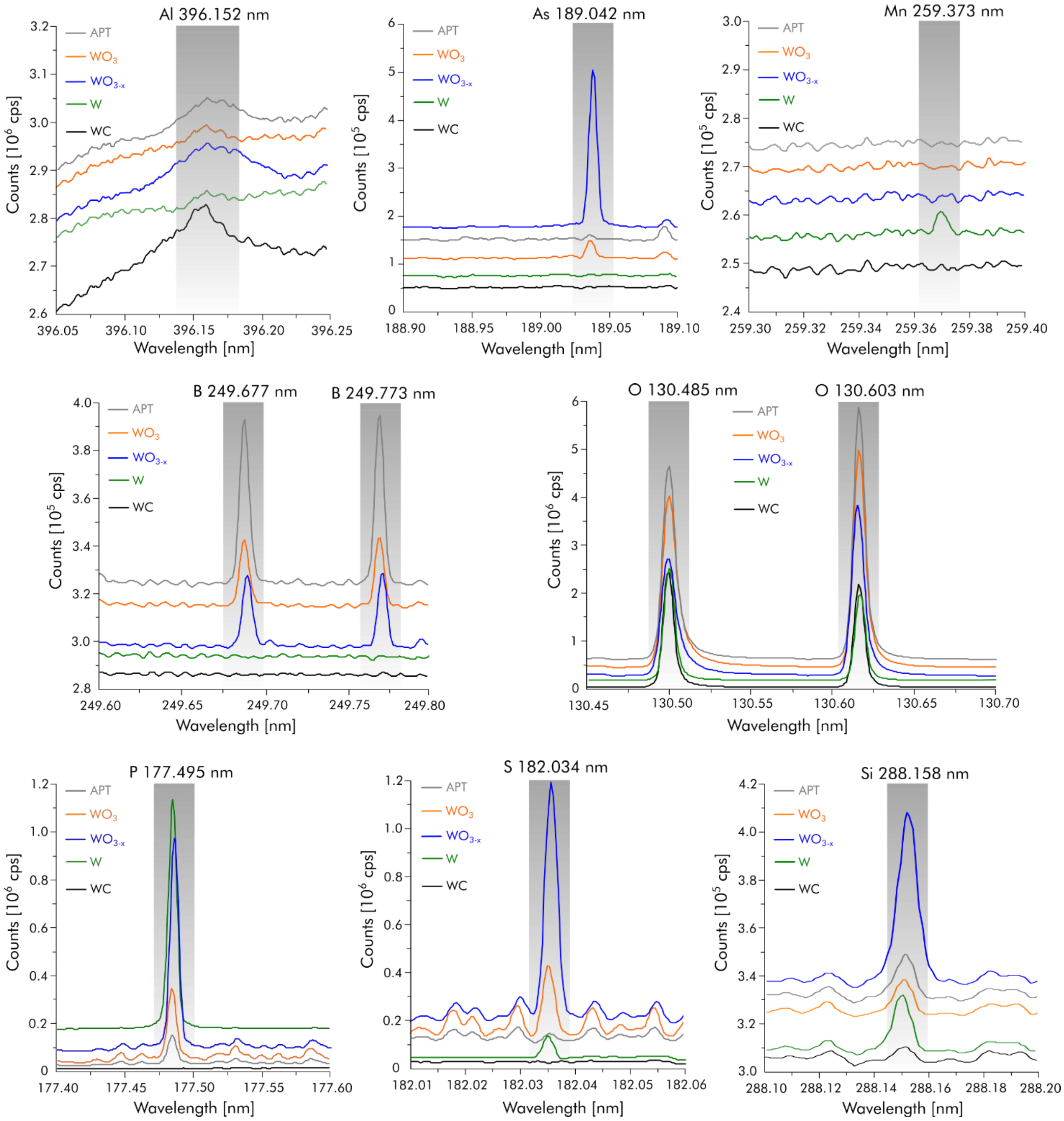

Figure S.1: Stacked full spectra for the selected elements, using samples of APT, WO$_3$, WO$_{3\text{-}x}$, W, WC, (using 15 mg of APT, W and W and 25 mg of WO$_3$ and WO$_{3\text{-}x}$)*

**Note from the authors: The full spectra are intended for background correction and the selection of specific emission lines. To obtain sharp peaks for this purpose, the temperature program used a higher heating rate, and the integration range was comparatively long (longer than that presented in S.2). Consequently, analytes with low concentrations, such as Al and Mn, may exhibit a low signal-to-noise ratio, resulting in less intense peaks.. For these elements, the detector range settings and background correction were applied using liquid standard solutions.*

Part II – Time vs. intensity plots for all elements and sample types

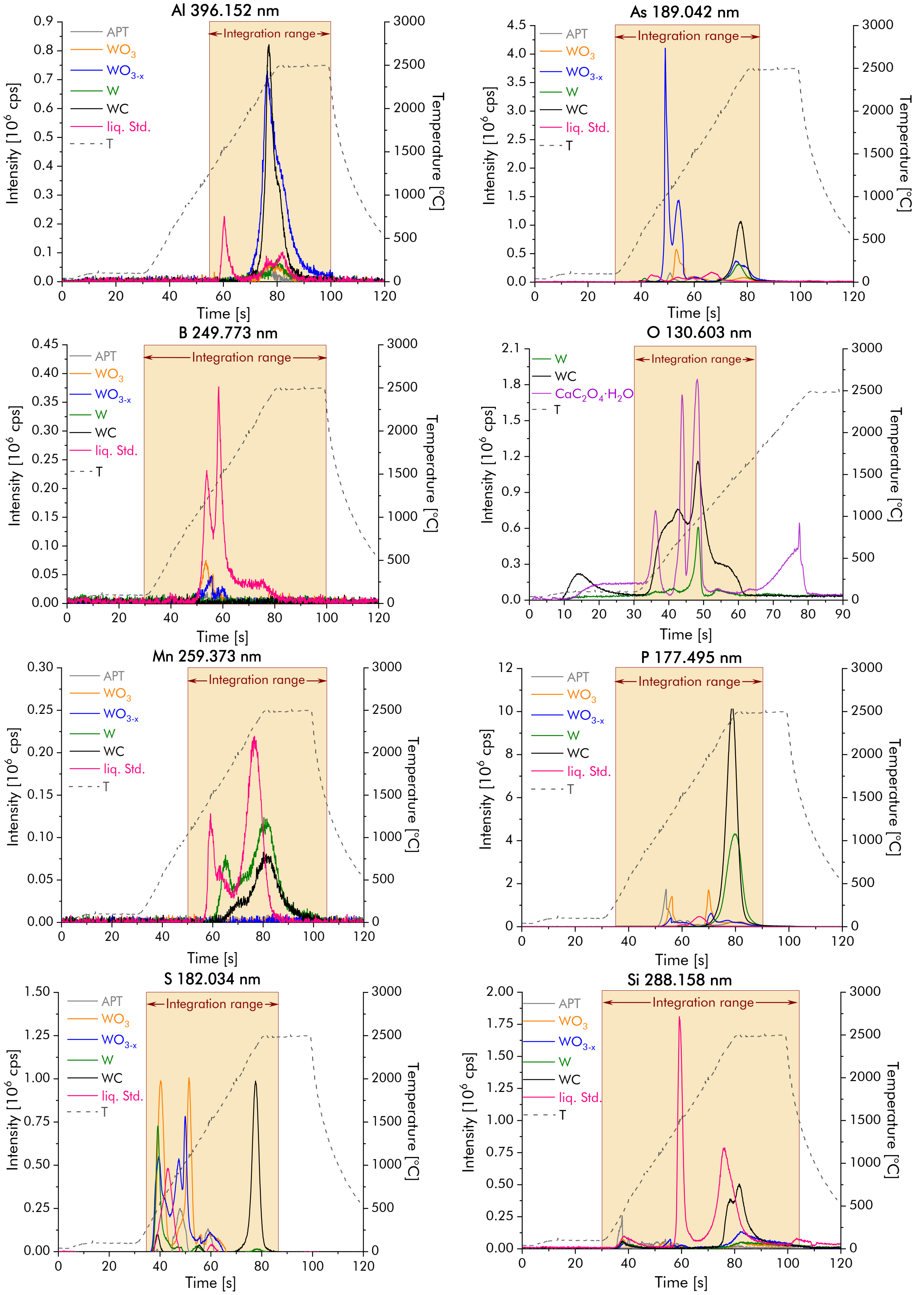

Figure S.2: Integration ranges for the selected elements, using samples of APT, WO_3, WO_{3-x}, W, WC, (using 15 mg each) as well as 2 μL of the prepared 10 ppm multi-element liquid standard and 0.25 mg of $CaC_2O_4{\cdot}H_2O$

Part III – Additional SEM-images of selected samples

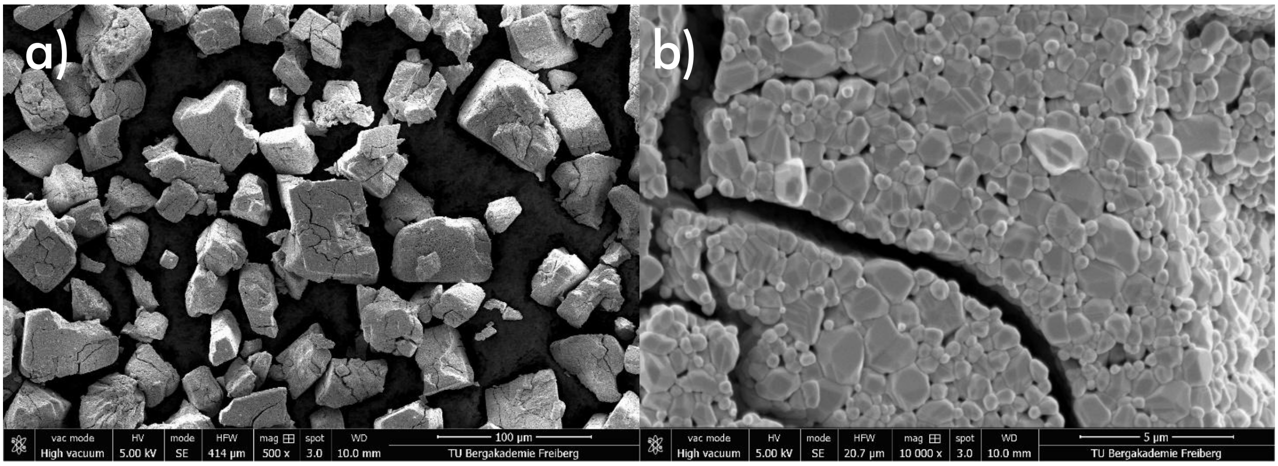

Figure S.3.1: SEM images of an original sample of WO_3 before treatment (SE mode, a) magnitude 500x b) a) magnitude 10000x)

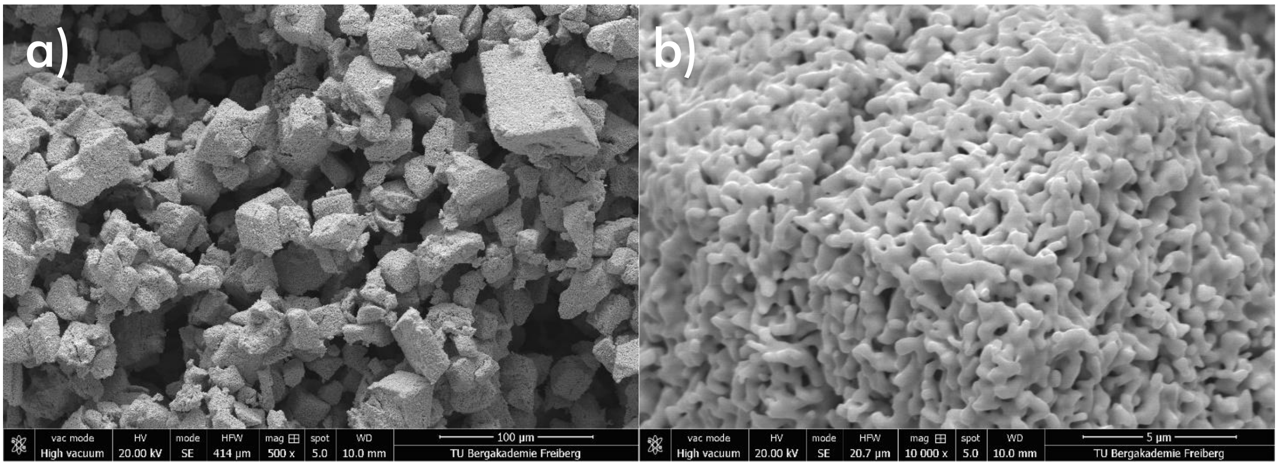

Figure S.3.2: SEM images of WO_3 after being heated to 2400 °C using H_2 as a modifier gas (SE mode, a) magnitude 500x b) a) magnitude 10000x)

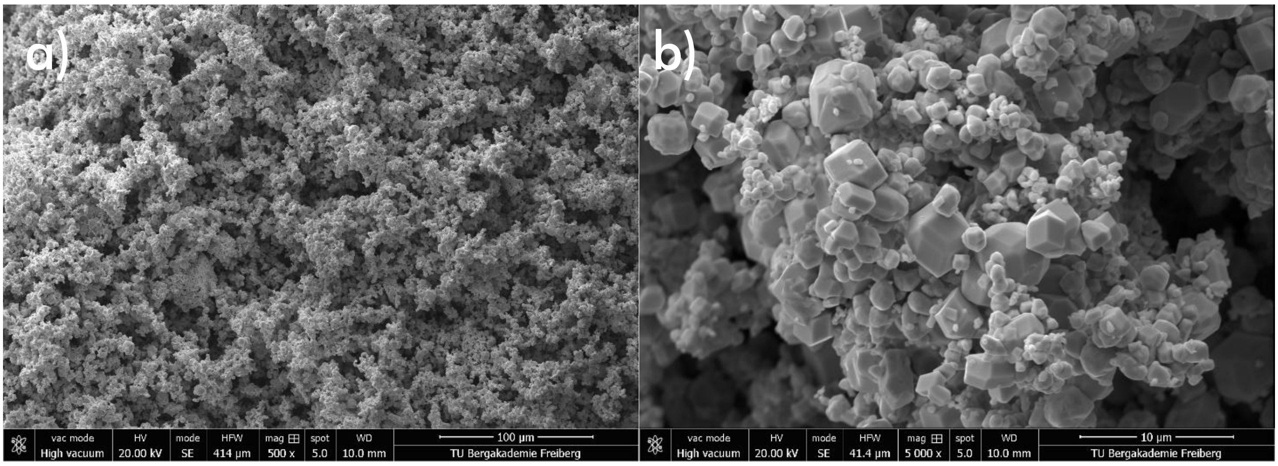

Figure S.3.3: SEM images of metallic tungsten powder after being heated to 2400 °C using H_2 as a modifier gas (SE mode, a) magnitude 500x b) a) magnitude 5000x)

Part IV – Calibration curves obtained by standard addition

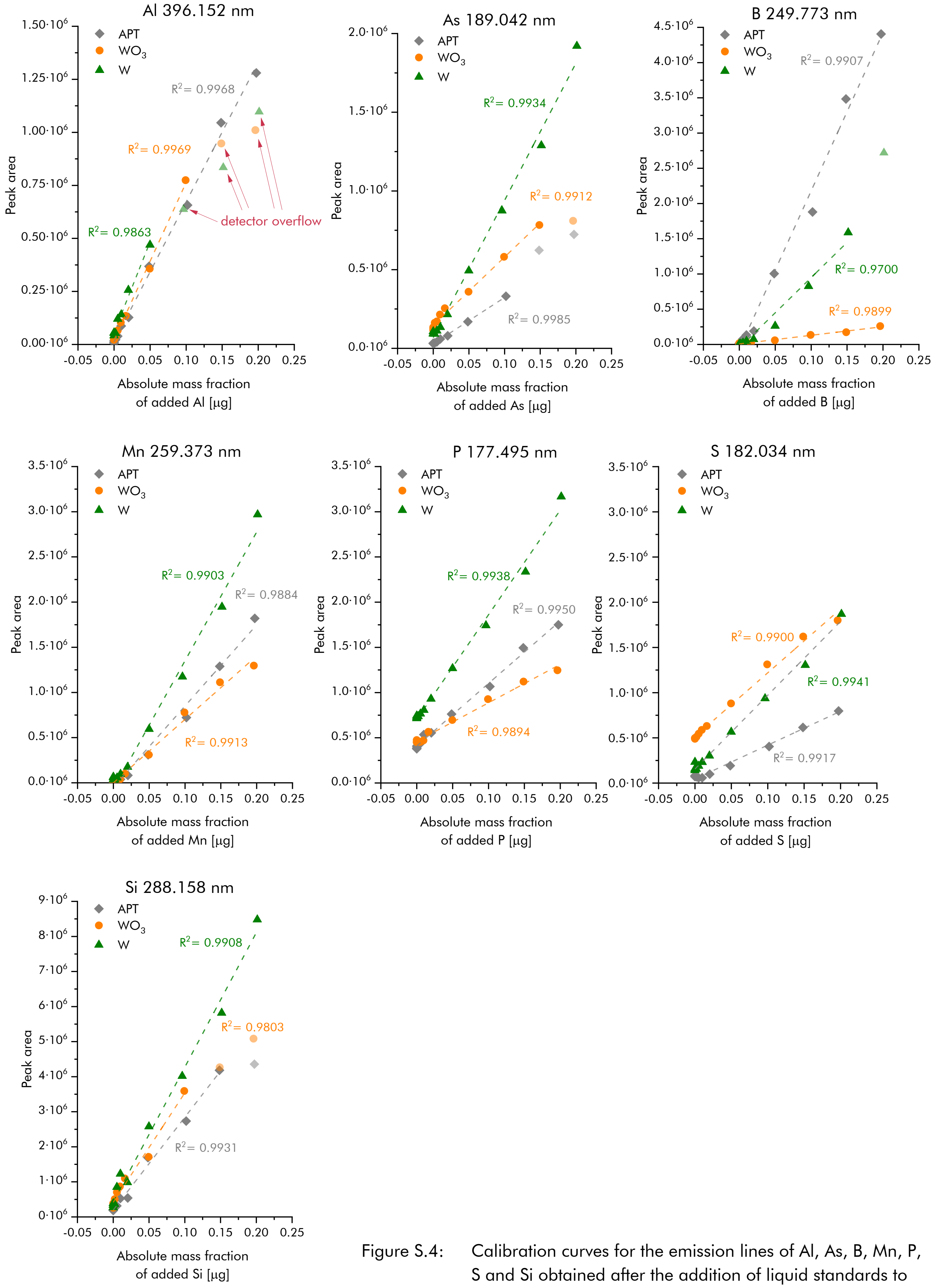

Figure S.4: Calibration curves for the emission lines of Al, As, B, Mn, P, S and Si obtained after the addition of liquid standards to selected samples of APT, WO_3 and W