Title

Valence and Oxide Impurities in MoS_2 and WS_2 Dramatically Change Its Electrocatalytic Activity Towards Proton Reduction

Authors

Naziah Latiff, Lu Wang, Carmen C. Mayorga-Martinez, Zdenek Sofer, Adrian C. Fisher, Martin Pumera*

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Figure S1. Energy Dispersive Spectroscopy (EDS) electron images, elemental mapping and spectrum for MoS₂, MoS₃, MoO₂ and MoO₃, taken at 1000X magnification.



Figure S2. Energy Dispersive Spectroscopy (EDS) electron images, elemental mapping and spectrum for WS₂, WS₃, WO₂ and WO₃ at 1000X magnification.



Figure S3. Scanning electron microscopy (SEM) images of MoS₂, MoS₃, WS₂, WS₃ and their 25% as-prepared mixtures. Only one mixture is shown here to represent the various concentrations tested as the remaining mixtures prepared would show very similar EDS mapping data. 25% MoS₃ is chosen as this was found to be representative proportion for good HER performance across the different MoS₂-MoS₃ mixtures tested.



Figure S4. Energy Dispersive Spectroscopy (EDS) electron images, elemental mapping and spectrum for MoS_2 , 25% MoS_3 and MoS_3 as-prepared samples drop-casted on SiO_2 wafer. Only one mixture is shown here to represent the various concentrations tested as the remaining mixtures prepared would show very similar EDS mapping data. 25% MoS_3 is chosen as this was found to be representative proportion for good HER performance across the different MoS_2 - MoS_3 mixtures tested.



Figure S5. Energy Dispersive Spectroscopy (EDS) electron images, elemental mapping and spectrum for WS_2 , 25% WS_3 and WS_3 as-prepared samples drop-casted on SiO₂ wafer. Only one mixture is shown here to represent the various concentrations tested as the remaining mixtures prepared would indicate very similar EDS mapping data. 25% WS_3 is chosen as this was found to be representative proportion for good HER performance across the different WS_2 - WS_3 mixtures tested.



Figure S6. Results from hydrogen evolution reaction (HER) experiments for WS₂ with different amounts of WO₂ impurities (left), and WO₃ impurities (right) in 0.5 M H₂SO₄ (aq) at a scan rate of 2 mV/s: (A) HER polarization curves of the various compounds tested, and (B) bar charts comparing their overpotentials at -10 mA/cm² current density.



Figure S7. Results from HER experiments for MoS_2 with different amounts of MoO_2 impurities (left), and MoO_3 impurities (right) in 0.5 M H₂SO₄ (aq) at a scan rate of 2 mV/s: (A) HER polarization curves of the various compounds tested, and (B) bar charts comparing their overpotentials at -10 mA/cm² current density.