

High-performance $\text{Bi}_2\text{Se}_3/\text{MXene}/\text{SWCNT}$ heterostructures as binder-free anodes in lithium-ion batteries

Raimonds Meija¹, Vitalijs Lazarenko^{1,2}, Yelyzaveta Rublova^{1,2}, Andrei Felsharuk¹, Jana Andzane¹, Oleksiy Gogotsi³, Ivan Baginskiy³, Veronika Zahorodna³, Aleksandrs Dutovs¹, Arturs Viksna⁴, Donats Erts^{1,4}

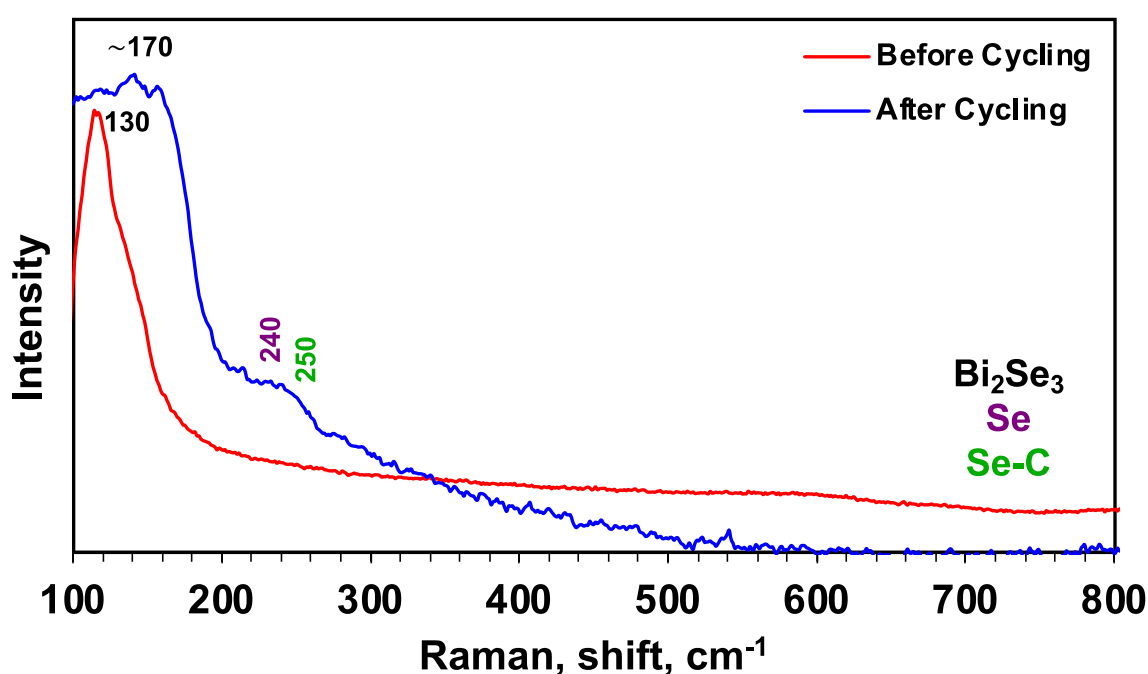
¹Institute of Chemical Physics, University of Latvia, Raina Blvd. 19, LV-1586 Riga, Latvia

²Nano RAY-T, Instituta str. 1, Ulbroka, LV-2130, Stopinu Parish, Latvia

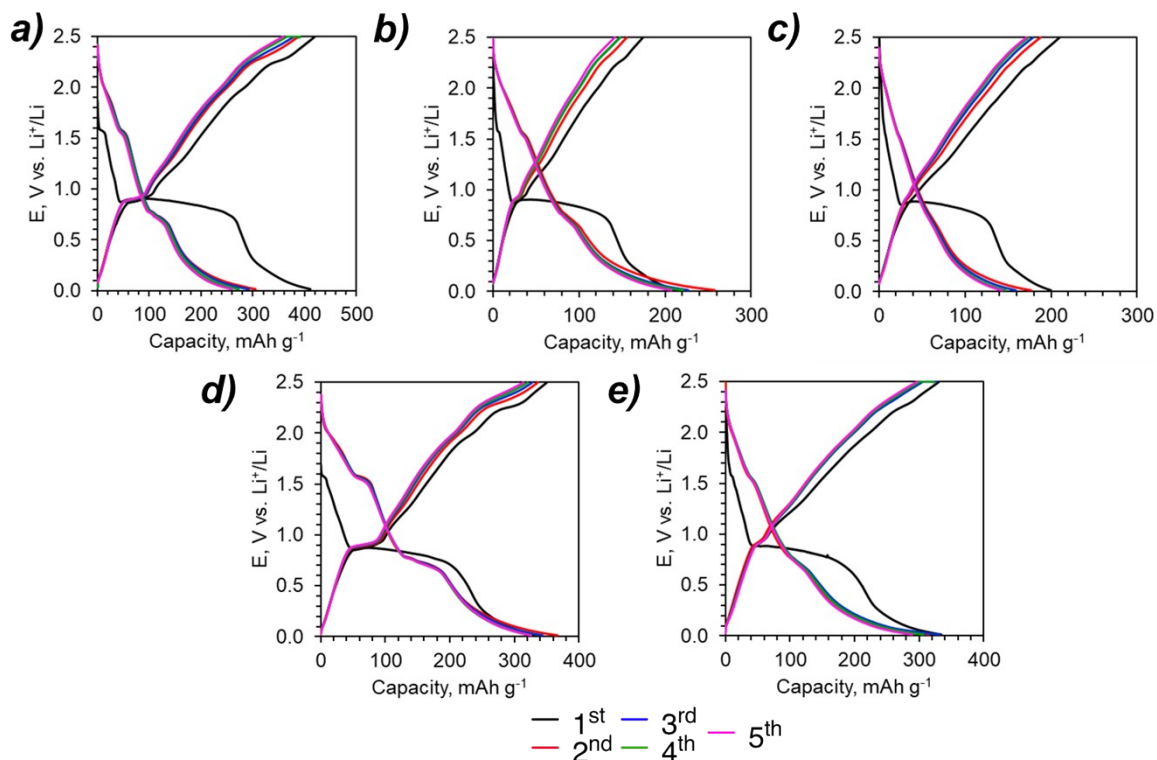
³Materials Research Center, 03680, St. Ak. Krzhizhanovskogo, 3 Kiev, Ukraine

⁴Faculty of Chemistry, University of Latvia, Raina Blvd. 19, LV-1586 Riga, Latvia

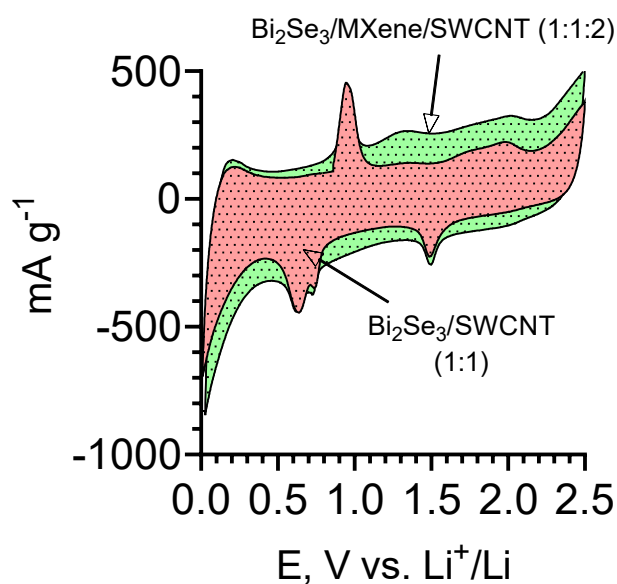
Supplementary information



Supplementary Figure S1. The Raman spectra of $\text{Bi}_2\text{Se}_3/\text{MXene}/\text{SWCNT}$ (1:1:2) before and after cycling.



Supplementary Figure S2. Charge discharge curves for first 5 cycles for following $\text{Bi}_2\text{Se}_3/\text{MXene}/\text{SWCNT}$ element compositions: **a)** (1:1:1), **b)** (1:2:2), **c)** (2:1:1), **d)** (1.5:2:0.5), **e)** (0.5:2:1.5).



Supplementary Figure S3. The capacitive process comparison from the CV curve area plots between $\text{Bi}_2\text{Se}_3/\text{SWCNT}$ (1:1) and $\text{Bi}_2\text{Se}_3/\text{MXene}/\text{SWCNT}$ (1:1:2) at the scan rate 1.0 mV s^{-1} .