Supporting Information

One-dimensional van der Waals Transition Metal Chalcogenide as an Anode Material for Advanced Lithium-ion Batteries

Woosung Choi[1,†], Seungbae Oh[2,†], Sunhyun Hwang[1,†], Sudong Chae[2], Hyunyoung Park[1], Wontae Lee[1], Chaeheon Woo[2], Xue Dong[5], Kyung Hwan Choi[5], Jungyoon Ahn[2], Yeongjin Kim[2], Xiaojie Zhang[2], Jinsu Kang[2], Hyeon-Seok Bang[2], Jiho Jeon[5], Hyung-Suk Oh[3,4], Jongsoon Kim[1,6], Jae-Young Choi[2,3,5,], and Won-Sub Yoon[1,6,*].*

[1]Department of Energy Science, Sungkyunkwan University, Suwon 16419, Republic of Korea.

[2]School of Advanced Materials Science & Engineering, Sungkyunkwan University, Suwon 16419, Republic of Korea.

[3]School of Advanced Materials Science & Engineering and KIST-SKKU Carbon-Neutral Research Center, Sungkyunkwan University, Suwon 16419, Republic of Korea

[4]Clean Energy Research Center, Korea Institute of Science and Technology (KIST), Seoul 02792, Republic of Korea

[5]SKKU Advanced Institute of Nanotechnology (SAINT), Sungkyunkwan University, Suwon 16419, Republic of Korea

[6]SKKU Institute of Energy Science and Technology (SIEST), Sungkyunkwan University, Suwon 16419, Republic of Korea

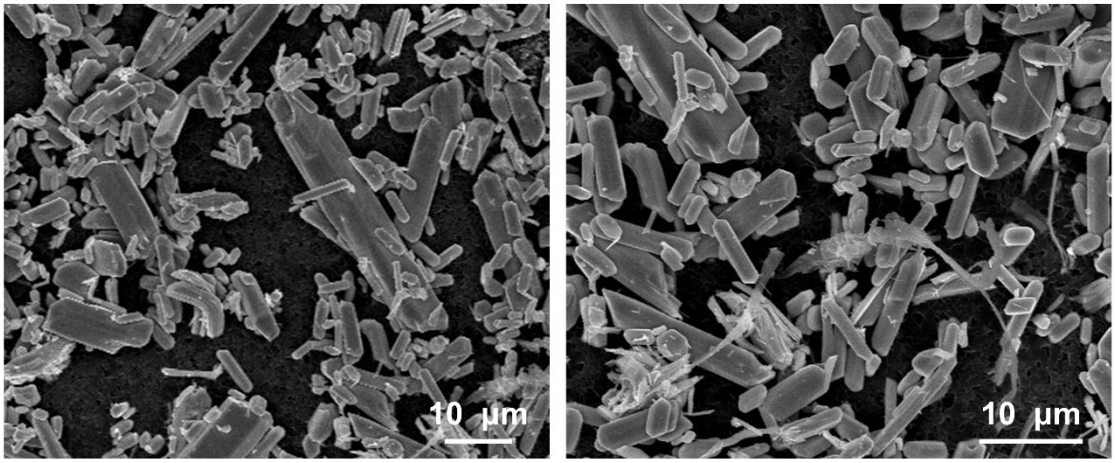

Fig. S1 SEM images of obtained 1D vdW Nb_2Se_9 powder.

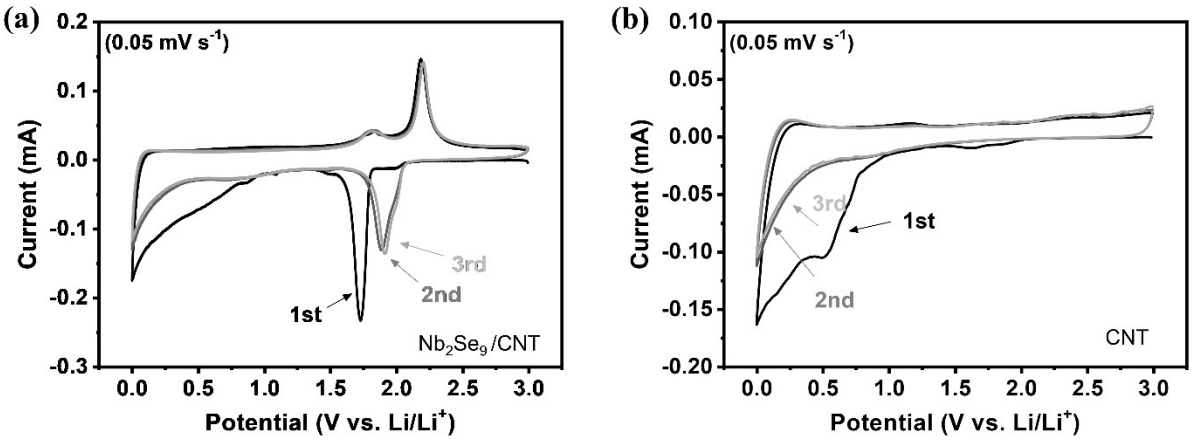

Fig. S2 CV data of Nb_2Se_9/CNT and CNT electrodes upon three cycles

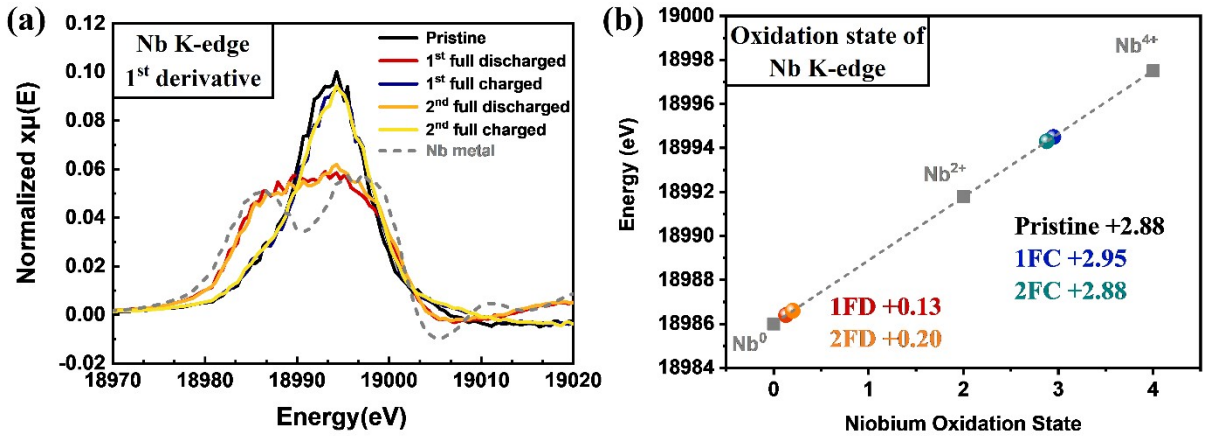

Fig. S3 (a) First derivative spectra of Nb K-edge obtained from Fig. 5b, and the (b) determined average valence state of Nb at pristine, 1FD, 1FC, 2FD, and 2FC with Nb^0, Nb^{2+}, and $Nb4^+$ as reference data.

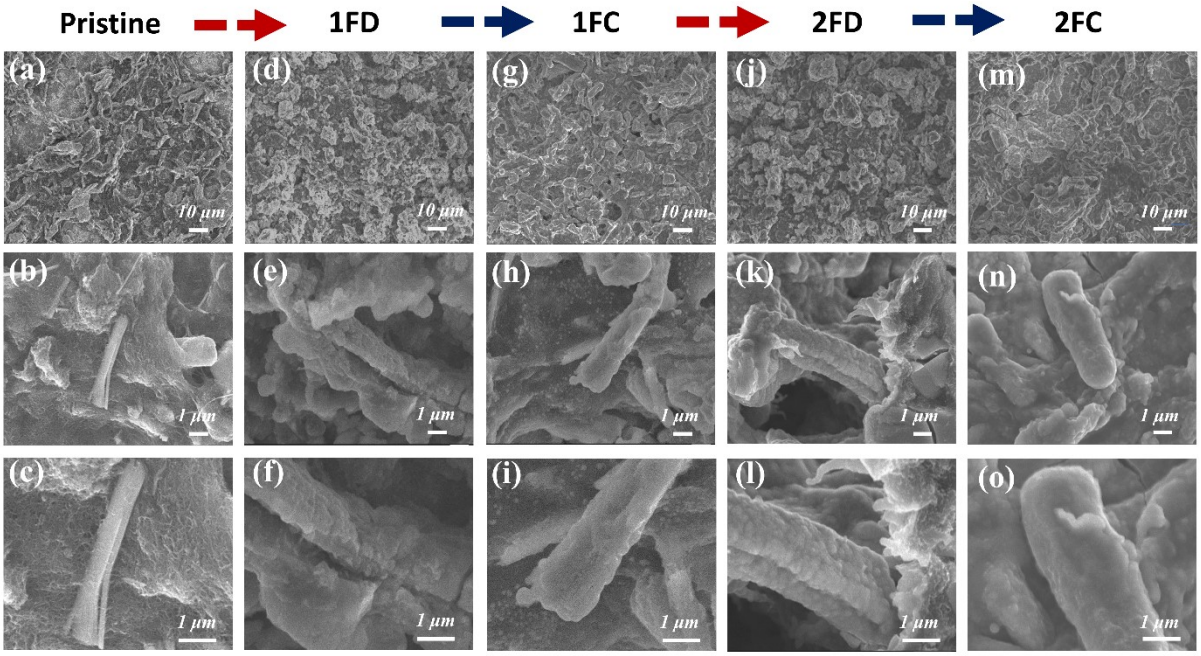

Fig. S4 SEM images of 1D vdW Nb_2Se_9 electrode materials at (a–c) pristine, (d–f) first discharge, (g–i) first charge, (j–l) second discharge, and (m–o) second charge.