**Supplementary Materials**

**Superb Li-ion storage of Sn-based anode assisted by the conductive hybrid buffering matrix**

Jinsil Shin1, Sung-Hoon Park2\*, Jaehyun Hur1\*

1Department of Chemical and Biological Engineering, Gachon University, 1342 Seongnam-daero, Seongnam 13120, Republic of Korea

2Department of Mechanical Engineering, Soongsil University, 369 Sangdo-ro, Dongjakgu, Seoul 06978, Republic of Korea

Correspondence should be addressed to Prof. Jaehyun Hur\* (jhhur@gachon.ac.kr) and Prof. Sung-Hoon Park\* (leopark@ssu.ac.kr).

**스크린샷, 그래픽, 폰트, 디자인이(가) 표시된 사진

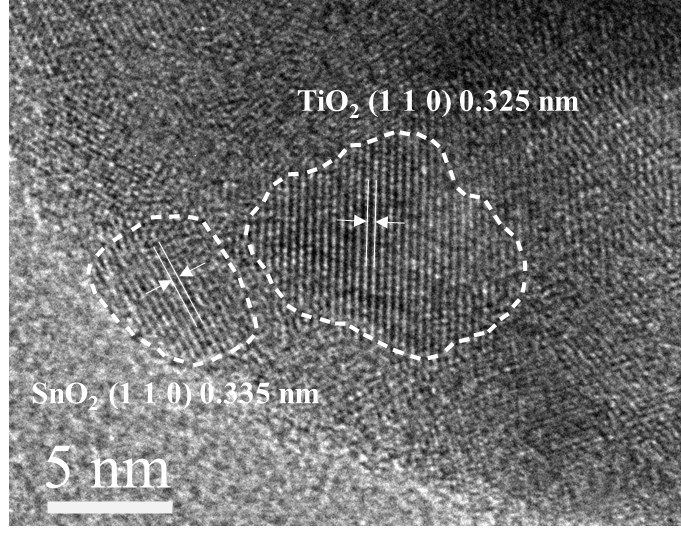
자동 생성된 설명**

**Figure S1.** Enlarged view of XRD spectra of (a) Sn-TiO2-C (20 wt%) and (b) Sn-TiO2 along with theoretical peak of rutile TiO2 (PDF#21-1276).

**스크린샷, 다채로움, 라인, 빛이(가) 표시된 사진

자동 생성된 설명**

**Figure S2.** XRD spectra of Sn-TiO2 after 20 h and 30 h milling.



**Figure S3.** HRTEM image of Sn-TiO2-C (20 wt%) showing the existence of SnO2.

**스크린샷, 그래픽, 그래픽 디자인, 예술이(가) 표시된 사진

자동 생성된 설명Figure S4.** (a) SEM image and (b) particle size distribution of Sn-TiO2-C (20wt%).

**빛, 밤이(가) 표시된 사진

중간 신뢰도로 자동 생성된 설명**

**Figure S5.** High-resolution XPS spectra of Sn-TiO2 powder. (a) survey (b) Sn, (c) Ti, (d) O (OL (lattice oxygen), O-H bond, and Os (adsorbed oxygen)), and (e) C

**블랙, 어둠이(가) 표시된 사진

자동 생성된 설명**

**Figure S6.** The equivalent circuit for (a) Sn-TiO2-C (20 wt%) and (b) Sn-TiO2 and Sn-C (20 wt%)

**Table. S1.** Theoretical capacity of Sn-TiO2-C (20 wt%), Sn-TiO2, and Sn-C (20 wt%)

|  |  |
| --- | --- |
| **Composite** | **Theoretical capacity** |
| Sn-TiO2-C (20 wt%) | 657 mAh g-1 |
| Sn-TiO2 | 728 mAh g-1 |
| Sn-C (20 wt%) | 869 mAh g-1 |

**Table S2.** Performance of Sn-based anode for Li-ion batteries

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Composite** | **Specific capacity** | **Cycles number** | **Current density** | **Ref** |
| Sn-C | 410 mAh g-1 | 100 cycles | 100 mA g-1 | [19] |
| Sn-Co | 515.5 mAh g-1 | 50 cycles | 50 mA g-1 | [20] |
| Sn/CNT | 413 mAh g-1 | 100 cycles | 30 mA g-1 | [21] |
| Sn-Ca | 280 mAh g-1 | 60 cycles | 50 mA g-1 | [22] |
| 3D Cu-Sn | 590 mAh g-1 | 50 cycles | 0.3 C | [23] |
| Sn-Ni | 448.9 mAh g-1 | 20 cycles | 0.1 C | [24] |
| SnSb-C | 300 mAh g-1 | 100 cycles | 100 mA g-1 | [25] |
| SnS*x*/NRGO | 562 mAh g-1 | 200 cycles | 0.2 A g-1 | [26] |
| Sn-TiO2-C | 669 mAh g-1 | 100 cycles | 200 mA g-1 | This work |

**Table S3.** Coulombic efficiency of Sn-TiO2-C, Sn-TiO2, and Sn-C at 1, 2, 3, 10, and 50th cycle at current density of 200 mA g-1

|  |  |  |  |
| --- | --- | --- | --- |
| **Cycle number** | **Coulombic efficiency** | | |
| Sn-TiO2-C (20 wt%) | Sn-TiO2 | Sn-C (20 wt%) |
| **1st** | 81.89 | 63.54 | 73.50 |
| **2nd** | 84.38 | 67.56 | 90.78 |
| **3rd** | 95.51 | 89.12 | 91.24 |
| **10th** | 98.31 | 96.19 | 94.43 |
| **50th** | 98.73 | 98.30 | 97.54 |

**Table S4.** Fitted parameter values of Rs, Rct1, and Rct2 of Sn-TiO2-C (20 wt%), Sn-TiO2, and Sn-C (20 wt%) at 200 mA g-1 after 20 cycles

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Sn-TiO2-C (20 wt%) | Sn-TiO2 | Sn-C (20 wt%) |
| Rs | 2.62 | 5.59 | 3.56 |
| Rct1 | 4.83 ⅹ 101 | 6.45 ⅹ 101 | 9.83 ⅹ 101 |
| Rct2 | 1.80 ⅹ 102 | 2.17 ⅹ 102 | 1.95 ⅹ 102 |