Investigating transition metal crosstalk on SEI stability as a function of anode chemistry

Sunggyu Yoon[1,2], Sung-Jin Chang[3], Kangwoo Ahn[4]*, Minkyu Kim[1,2]*

[1]Department of Chemistry, Inha University, 100 Inha-ro, Michuhol-gu, Incheon, 22212, Republic of Korea

[2]Department of Chemistry and Chemical Engineering, Inha University, 100 Inha-ro, Michuhol-gu, Incheon, 22212, Republic of Korea

[3]Center for Analysis and Evaluation, National Nanofab Center, Deajeon 34141, Republic of Korea

[4]Pohang Accelerator Laboratory (PAL), Pohang University of Science and Technology (POSTECH), Pohang, Gyeongbuk 37673, Republic of Korea

*Corresponding Author: minkyu.kim@inha.ac.kr (Minkyu Kim), ariel797@postech.ac.kr (Kangwoo Ahn)

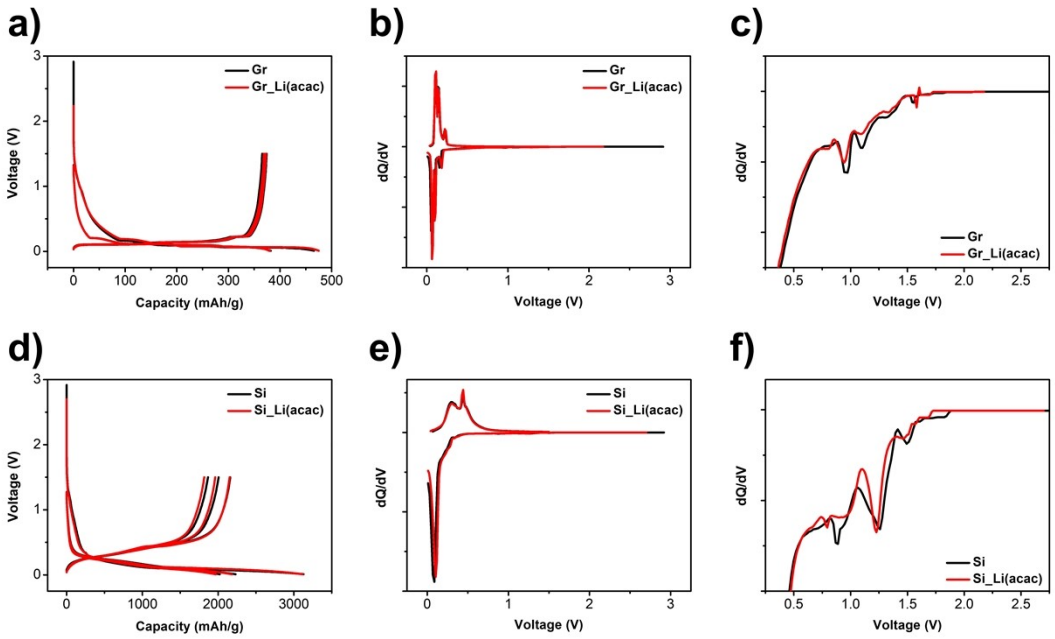

Figure S1. Voltage vs. capacity curves during the initial three cycles for a) graphite electrodes and c) Si electrodes without salt addition and with the addition of Li(acac) in the electrolyte. Differential capacity vs. voltage curves during the first cycle and the magnified electrolyte decomposition region for b), d) graphite electrodes and e), f) Si electrodes without salt addition and with the addition of Li(acac) in the electrolyte.

Table S1. BET surface area, pore volume and pore size of anode substrate materials.

	BET surface area (m^2/g)	**Pore volume (cm^3/g)**	**Pore size (Å)**
Graphite	1.1722	0.004388	149.733
Si	61.9258	0.246732	159.372

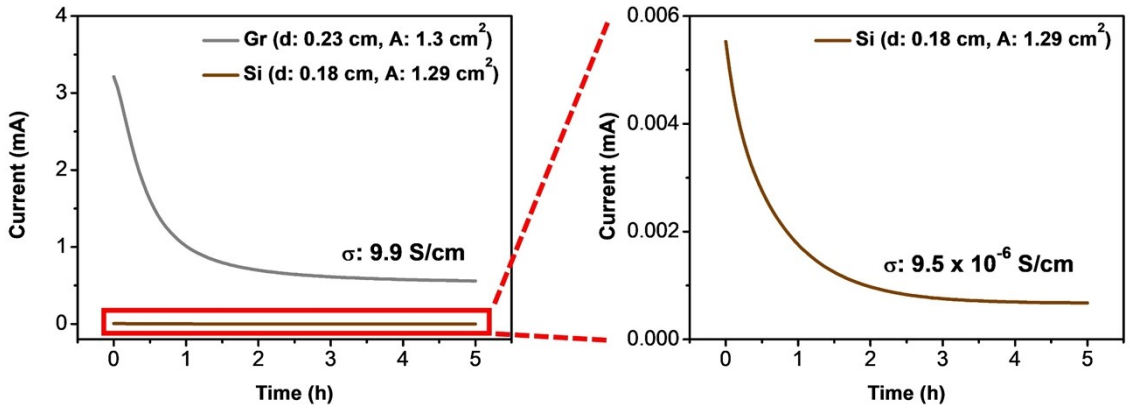

Figure S2. Current vs. time curves during chronoamperometry test for graphite and Si pellets. d is the thickness of the pellet, and A is the cross-sectional area of the pellet.

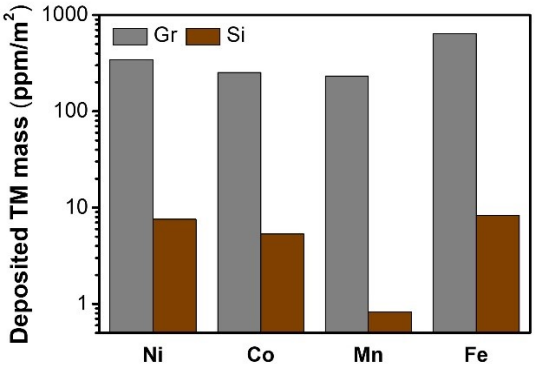

Figure S3. The amount of TM ions per surface area observed on graphite and Si electrodes after SEI formation when 10 mM of TM salts were added to electrolytes. The graphite and Si electrodes were prepared with the same composition (active material : carbon black : binder = 6 : 3 : 1). TM ions were measured using inductively coupled plasma optical emission spectroscopy (ICP-OES) or inductively coupled plasma spectrometry (ICP-MS).

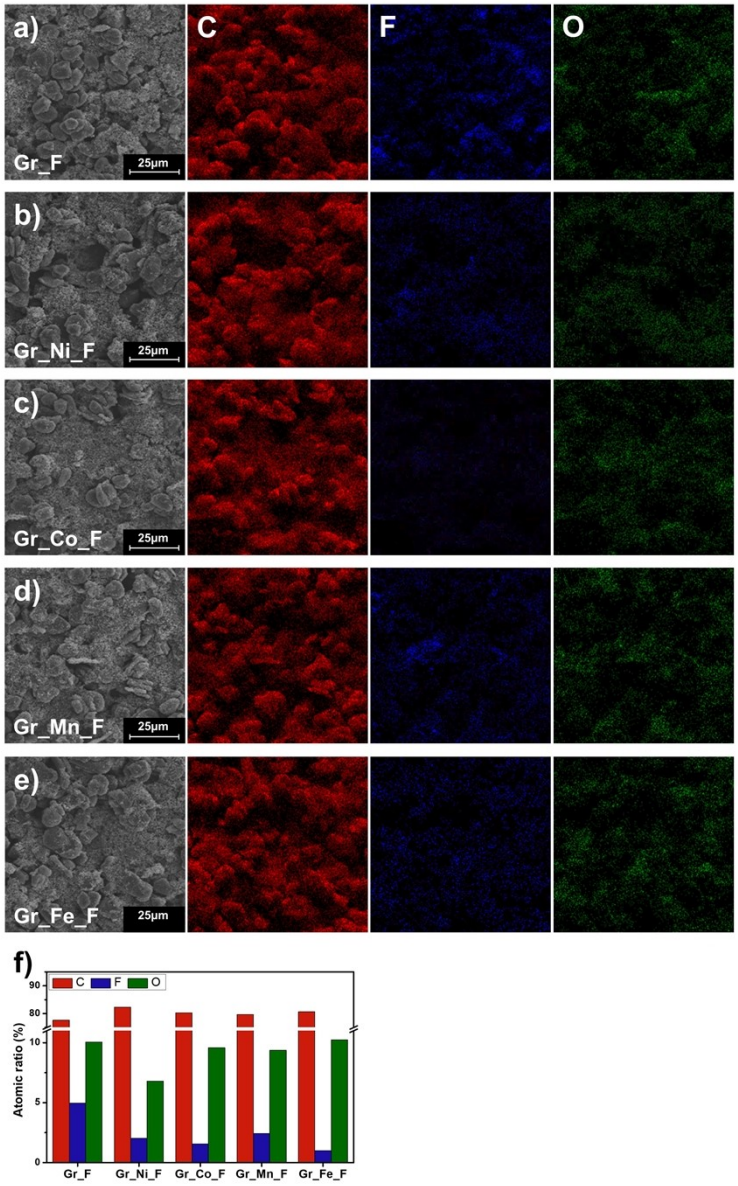

Figure S4. SEM images and corresponding EDS maps of graphite electrodes after formation process for a) Gr_F, b) Gr_Ni_F, c) Gr_Co_F, d) Gr_Mn_F and e) Gr_Fe_F. f) Relative atomic ratio of selected region.

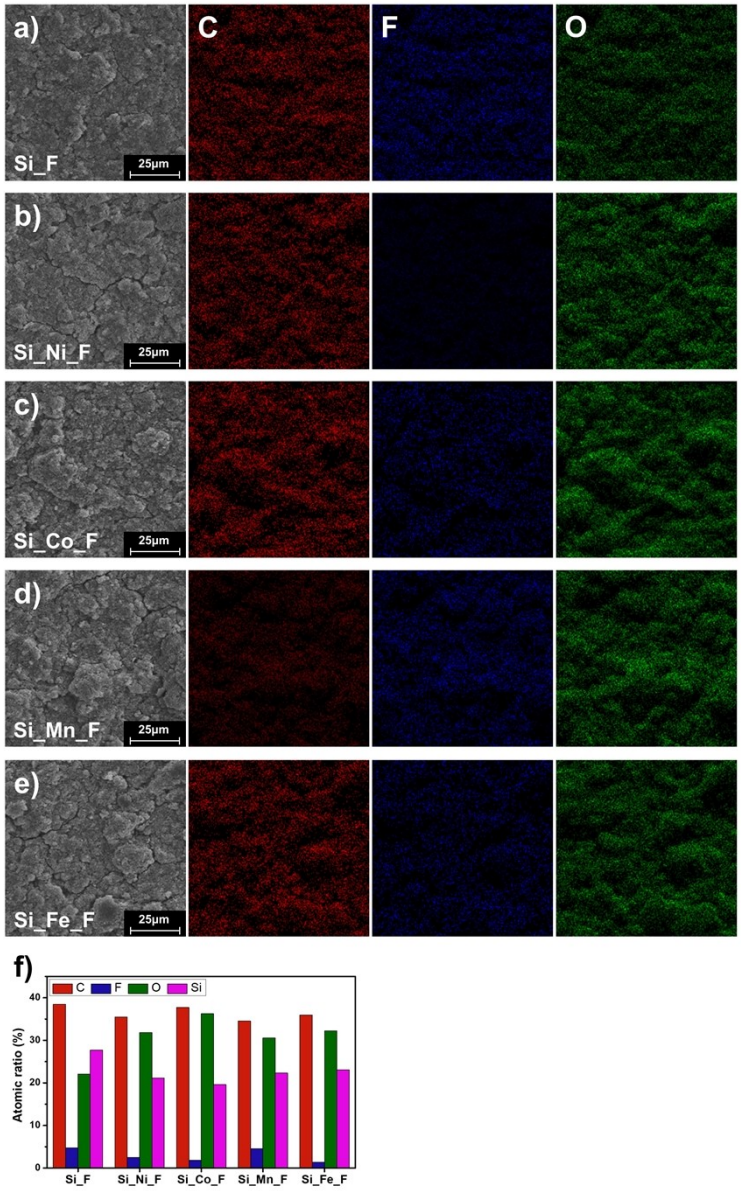

Figure S5. SEM images and corresponding EDS maps of graphite electrodes after formation process for a) Si_F, b) Si_Ni_F, c) Si_Co_F, d) Si_Mn_F and e) Si_Fe_F. f) Relative atomic ratio of selected region.

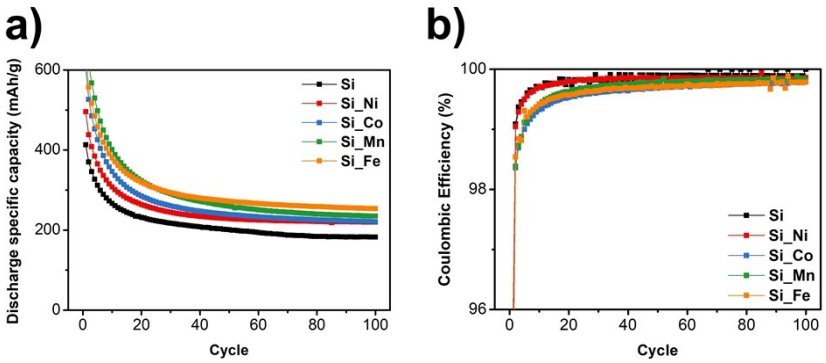

Figure S6. a) Discharge-specific capacity vs. cycle number curves and b) coulombic efficiencies vs. cycle number curves of Si electrodes over 100 cycles at 0.2 C with a cutoff voltage of 0.1 V.