

Description of Additional Supplementary Files

File Name: Supplementary Movie 1

Description: Lithiation of SnO₂@GC-21 with appropriate void space to observe the void space utilization. The movie is played at 8x speed.

File Name: Supplementary Movie 2

Description: Lithiation of SnO₂@GC-21 with appropriate void space to observe the SnO₂ NPs expansion within the void of graphene network. The movie is played at 8x speed.

File Name: Supplementary Movie 3

Description: Lithiation of SnO₂@GC-21 with appropriate void space to observe the single SnO₂ nanoparticle transformation. The movie is played at 8x speed.

File Name: Supplementary Movie 4

Description: Lithiation of SnO₂@GC-0 with insufficient void space. The movie is played at 8x speed.

File Name: Supplementary Movie 5

Description: Lithiation of SnO₂@GC-49 with excess void space. The movie is played at 8x speed.