Supporting information for:

Direct Imaging of Layered O3- and P2-Na$_x$Fe$_{1/2}$Mn$_{1/2}$O$_2$

Structures at Atomic Scale

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Supporting Figures and Figure captions:

(a)

2 nm
Figure S1. Original (a) HAADF and (b) ABF images for the as-prepared P2-phase Na$_{2/3}$Fe$_{1/2}$Mn$_{1/2}$O$_2$ samples at [010] zone axis; (c) shows the enlarged region of Figure S1b; The corresponding line profiles of B and A in figure S1(c) are demonstrated in Figure S1(d) and figure S1(e). In the ABF line profile, image contrast of the dark dots is inverted and displayed as peaks.
Figure S2. Original (a) HAADF and (b) ABF images for the as-prepared O3-phase NaFe$_{1/2}$Mn$_{1/2}$O$_2$ samples at [010] zone axis. The corresponding line profiles of A in figure S2b is demonstrated in Figure S2(c). In the ABF line profile, image contrast of the dark dots is inverted and displayed as peaks.
Figure S3. Original HAADF (a) O3-phase and (b ~ e) P2-phase Na$_x$Fe$_{1/2}$Mn$_{1/2}$O$_2$ samples at [010] zone axis.
Figure S4. Original HAADF (a), (b) and ABF (c) images of the surface structure without obvious Na-M antisites; (d) the HAADF image of the surface structure with obvious Na-M antisites in O3-phase NaFe$_{1/2}$Mn$_{1/2}$O$_2$ sample. The HAADF images (e) and (f) the surface structure without/with obvious Li-M antisite and ABF image (g) with obvious Na-M antisite in P2-phase Na$_{2/3}$Fe$_{1/2}$Mn$_{1/2}$O$_2$ samples at [010] zone axis.

Figure S5. Oxygen matrixes in the lattice of the layered (a) O3 phase, (b) O1phase and (c) O2 phase viewed at [0100] directions.
Figure S6. The schematic representation of the atomic structure of (a) O3 phase and (b) P2 phase Na$_x$Fe$_{1/2}$Mn$_{1/2}$O$_2$ at [010] zone axis.