NaAlO$_2$ and $\gamma$-Al$_2$O$_3$ Nanoparticles by Pulsed Laser Ablation in Aqueous Solution

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Supplement 1. X-ray diffraction of NaAlO$_2$.4/5H$_2$O (denoted as h-N), β-NaAlO$_2$ (denoted as β-N) and γ-Al$_2$O$_3$ (denoted as γ) condensates fabricated by PLAL under 0.05 M NaOH with a peak power density of 1.8×10$^{11}$ W/cm$^2$ for 5 min and then centrifuged. The broad diffraction below 30 degree 2θ is due to silica substrate.
Supplement 2. SEM, (a) SEI, (b) and (c) point-count EDX spectra taken from platy hydrous NaAlO$_2$.4/5H$_2$O (point b) and powdery matrix (point c) which were deposited by PLAL under 0.05 M of NaOH and then collected on a glass substrate. The Si and Pt counts are from glass substrate and Pt coating, respectively.
Supplement 3. SEM, (a) SEI, (b) and (c) point-count EDX spectra of partially dehydrated sodium aluminate and $\gamma$-$\text{Al}_2\text{O}_3$-rich particulate, respectively in the sample as deposited by PLAL under 1 M of NaOH and then collected on a glass substrate. The Si and Pt counts are from glass substrate and Pt coating, respectively.
Supplement 4. TEM (a) BFI and (b) SAED pattern of \( \gamma \)-Al\(_2\)O\(_3\) nanoparticles assembled as nanochain aggregates when derived from the as-deposited sodium aluminate and \( \gamma \)-Al\(_2\)O\(_3\) nanocondensates fabricated by PLAL under 0.05 M of NaOH and then subject to electron beam for 30 min.
Supplement 5. Lattice image of \{111\} multiply twinned $\gamma$-Al$_2$O$_3$ nanocondensates fabricated by PLAL under 0.05M NaOH. The 2-D Fourier transforms from the square regions I, II and III show \{111\} twin boundary at I/II, and I/III interfaces; whereas \{110\} asymmetric tilt boundary (\(\bar{1}13\))$_\text{II}$/(\(\bar{1}11\))$_\text{III}$ at II/III interface, similar to that formed by PLA on Al under oxygen gas.$^3$
Supplement 6. TEM (a) lattice image of a representative $\gamma$-Al$_2$O$_3$ nanoparticle fabricated by PLAL in NaOH (0.05M) having d-spacings labeled in the magnified image inset, (b)(c) 2-D forward and inverse Fourier transform, respectively from the square region in (a), respectively showing 111 twin spot (denoted as t).
Supplement 7. (a) Raman and (b) FTIR spectra of the γ-Al₂O₃ and hydrous/anhydrous NaAlO₂ nanocondensates fabricated by PLAL under 0.05 M NaOH with a peak power density of $1.8 \times 10^{11}$ W/cm² for 5 min and then centrifuged.
Supplement 8. UV-visible absorption spectrum of the colloidal NaAlO$_2$ and $\gamma$-Al$_2$O$_3$ solution fabricated by PLAL under (a) 0.05 M and (b) 1 M NaOH showing nearly the same absorbance corresponding to a minimum band gap of ca. 5.3 eV, based on their intersections with the base line at 232 and 236 nm, respectively.