

Surfactant-free hydrothermal synthesis of lithium aluminate microbricks and nanorods from aluminum oxide nanoparticles

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Detailed Experimental Procedure

In the typical synthesis of lithium aluminate microbricks ($LiAlO_2$-MB), 0.03 mol of LiOH (0.71 g, Aldrich) and 0.0098 mol Al_2O_3 nanopowder (1 g, Aldrich) were stirred together with 36 mL distilled water for 1 hr (Li/Al = 3). Then the mixture was transferred to a Teflon-coated reactor (100 mL), and was put into hydrothermal reaction at a constant temperature (150 ^oC) without disturbing for 3 days. For the synthesis of lithium aluminate rectangular nanorods ($LiAlO_2$-RNR) similar procedure was employed, except that we used 0.15 mol (3.59 g) of LiOH (Li/Al = 15). The as-obtained white product was separated by centrifugation, washed with distilled water to remove the excess of LiOH and then dried in an oven at 100 ^oC for overnight and then calcined at 950 ^oC for 12 hr in air flow (200 mL/min). The products were characterized by a number of methodologies, including X-ray diffraction (XRD, MAC Science, M18XHF diffractometer with Cu Kα radiation), Scanning electron microscopy (FE-SEM, FEI XL30S), transmission electron microscopy (TEM, Philips CM-20 with an accelerating voltage of 200 kV), field emission high resolution transmission electron microscopy (FE-HREM, Jeol 2100F) selected area diffraction (SAED) pattern.

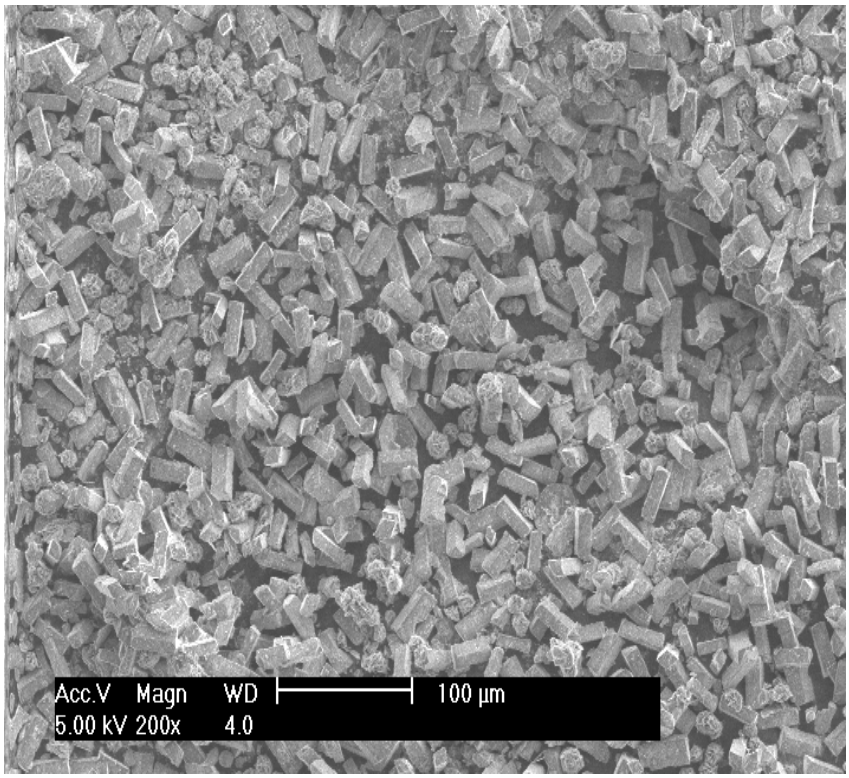

Figure S1 SEM image shows high uniformity in the morphology of the as-obtained micro-bricks.

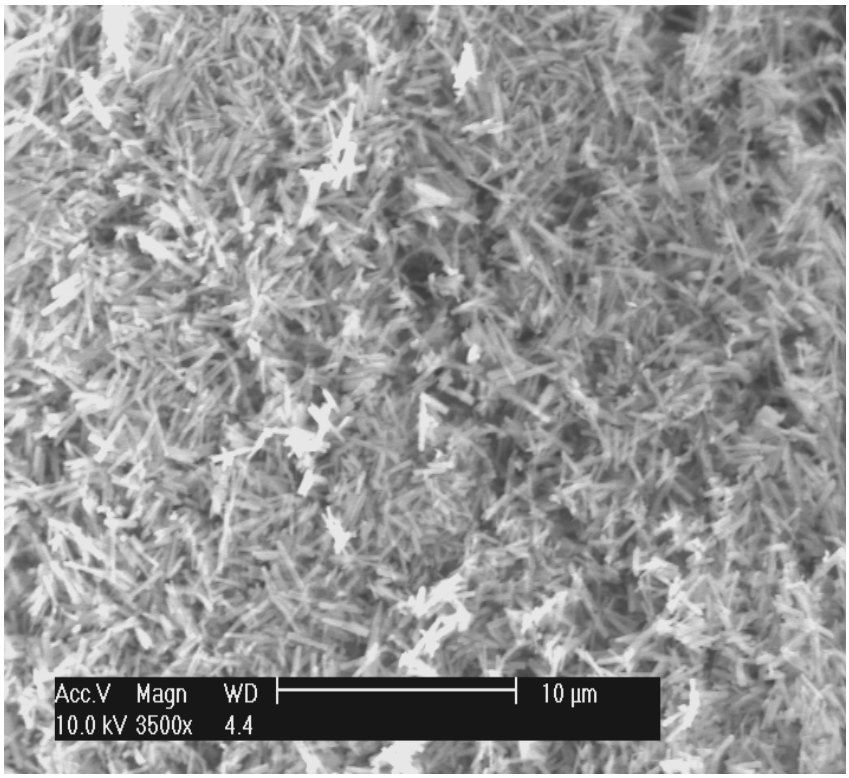

Figure S2 SEM image shows high uniformity in the morphology of the as-obtained nanorods.

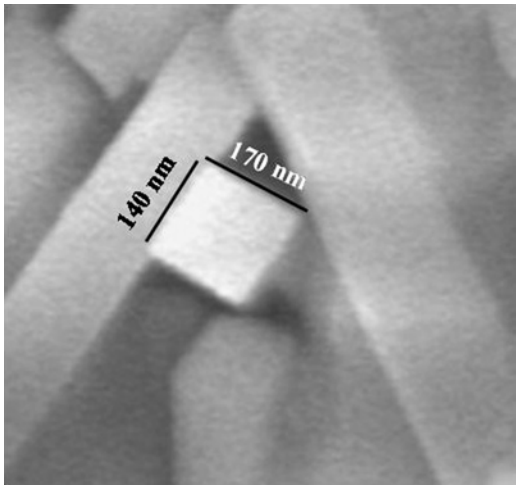

Figure S3 The high resolution SEM image shows the edges of a nanorod is 140 nm and 170 nm respectively, which clears the orthorhombic structure.

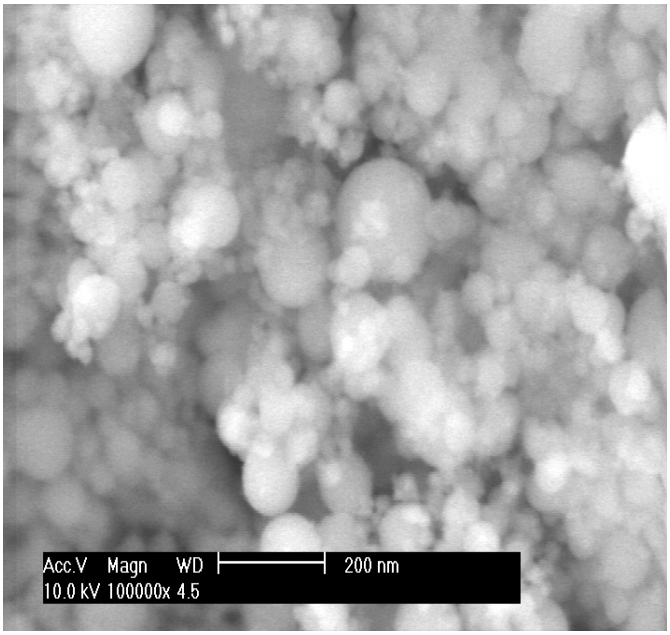

Figure S4 SEM image of the starting material, Al_2O_3 nanoparticles.

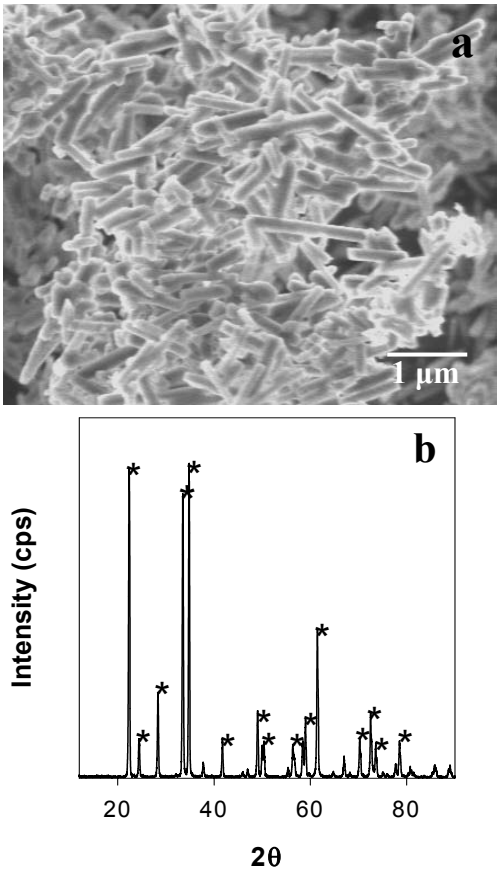

Figure S5. a) The SEM image of calcined sample shows the morphology still maintained. b) The XRD pattern of $LiAlO_2$ nanorods after heat treatment at 950 ^oC for 12 h. Note that the phase has been changed to γ-$LiAlO_2$ as indicated by (*).