Supplementary Material (ESI) for Chemical Communications

Supporting Information

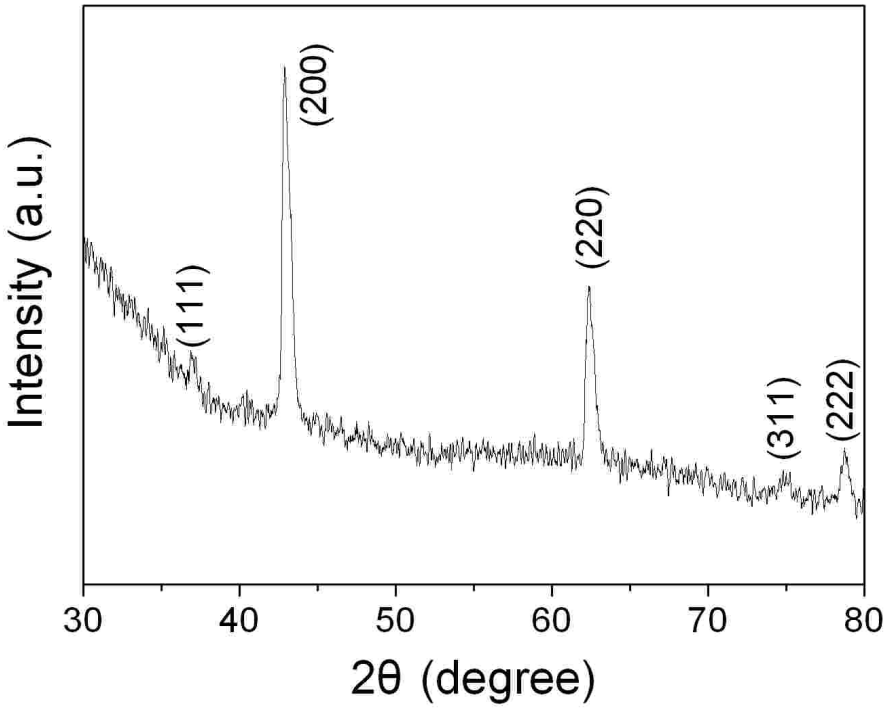
Peashell-like Nanostructure — A New Kind of One-dimensional Nanostructure: The Case of Magnesium Oxide

Jun Liu[†, ‡], Wenjun Wang[†], Zaiping Guo[‡], Rong Zeng[‡], Shixue Dou[‡] and Xiaolong Chen*[, †]
Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, P.O. Box 603, Beijing 100190
Institute for Superconducting and Electronic Materials, University of Wollongong, NSW 2522, Australia

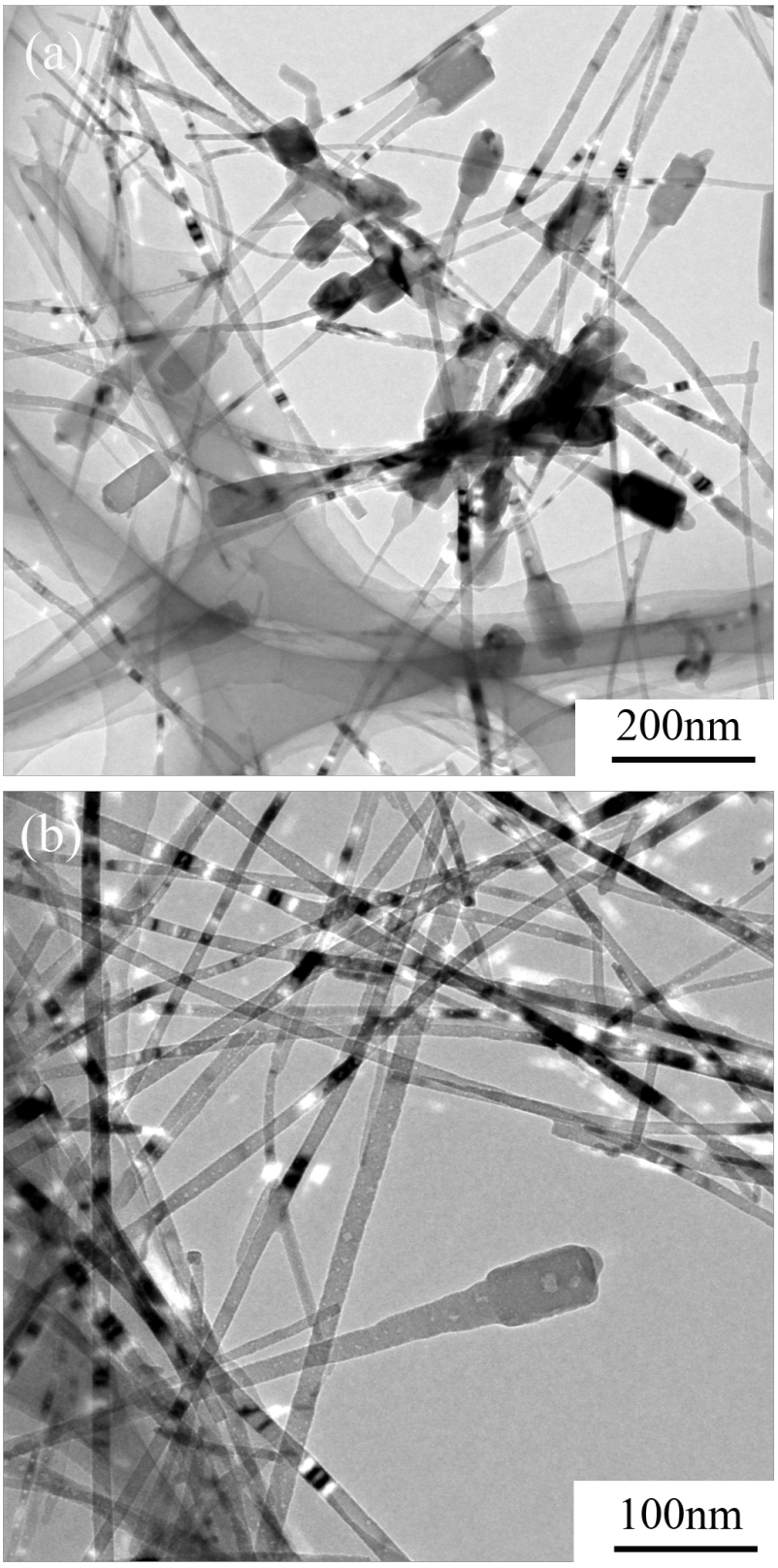
Experimental details

The ultra-fine 1D peashell-like MgO nanostructures were achieved by a self-catalysis VLS process in conjunction with the Kirkendall process. An alumina boat with pure Mg powders (1-2 g, 99.99%) was placed in the middle of a horizontal quartz tube furnace. The quartz tube was pumped, and then filled with argon and re-pumped. After repeating the operation three times, the quartz tube was full of argon. Then, the quartz tube was heated to 950 ºC in one hour under an argon flow of 30 standard cubic centimeters per minute (sccm). This allowed sufficient formation of Mg vapor, with some Mg droplets forming in the low-temperature zone. After the temperature reached 950 ºC, a sparse oxygen flow of 1 sccm mixed with argon flow of 200 sccm was suddenly introduced into the quartz tube and maintained for 10 minutes. Subsequently, the argon flow was adjusted to 30 sccm again, while the oxygen flow was kept at 1 sccm, and the furnace was naturally cooled. Then, any products in the alumina boat were collected.

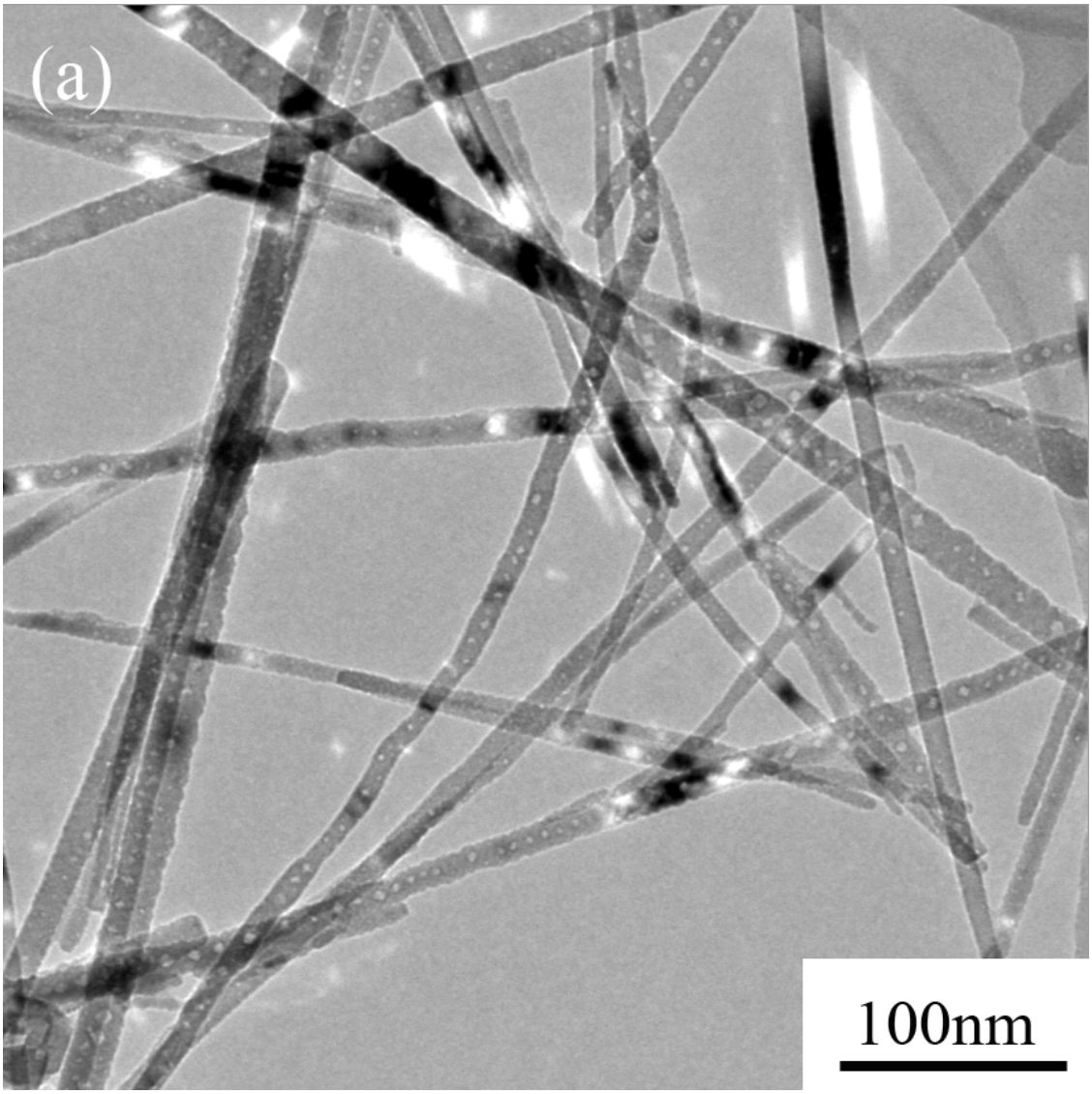
SI-1. X-ray diffraction patterns (XRD) of the product show that the product is cubic MgO.

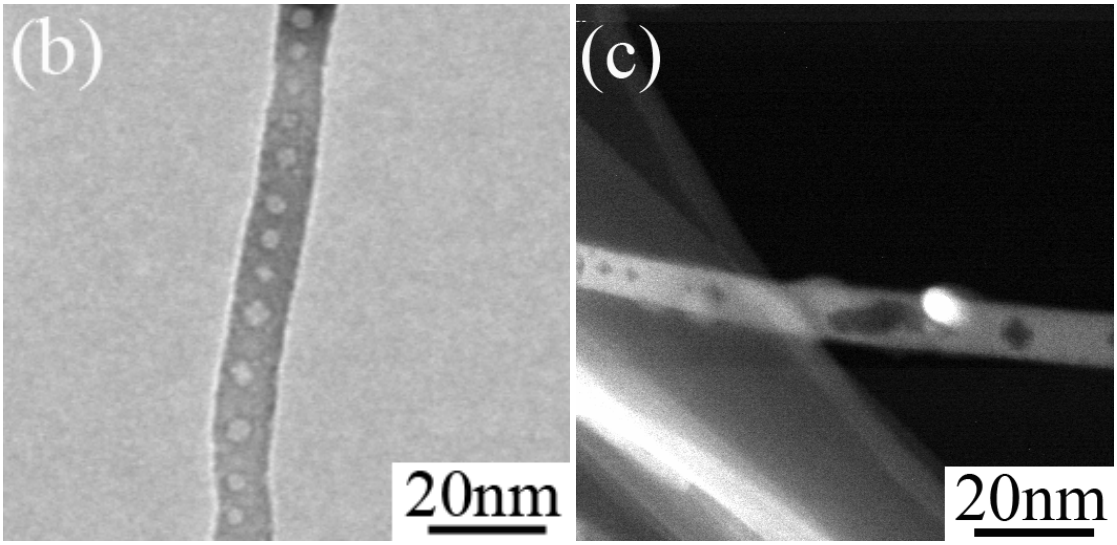


SI-2. The tip morphology of ultra-fine 1D peashell-like MgO nanostructures

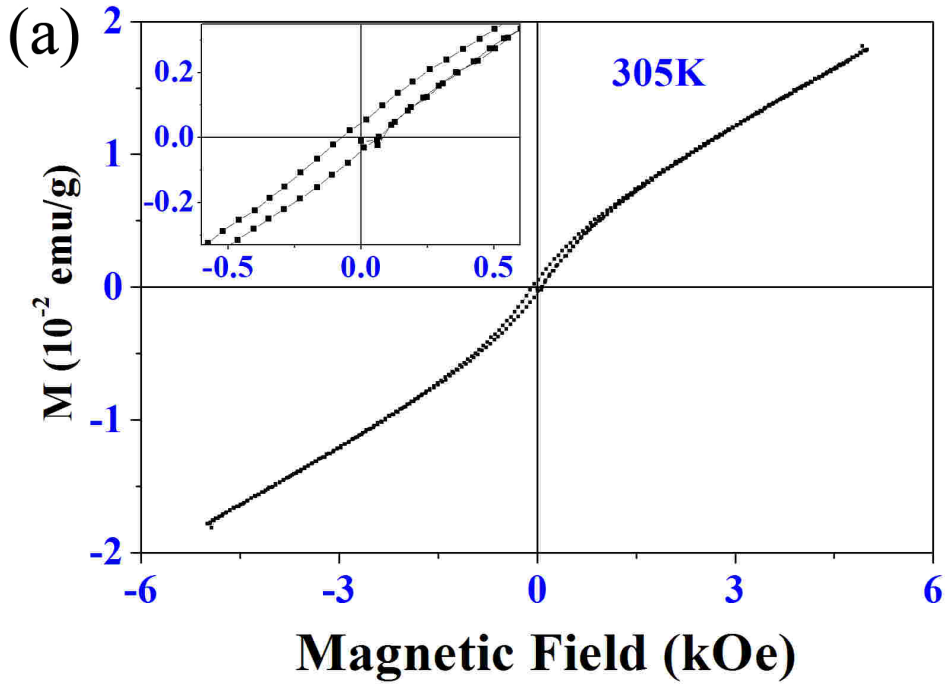


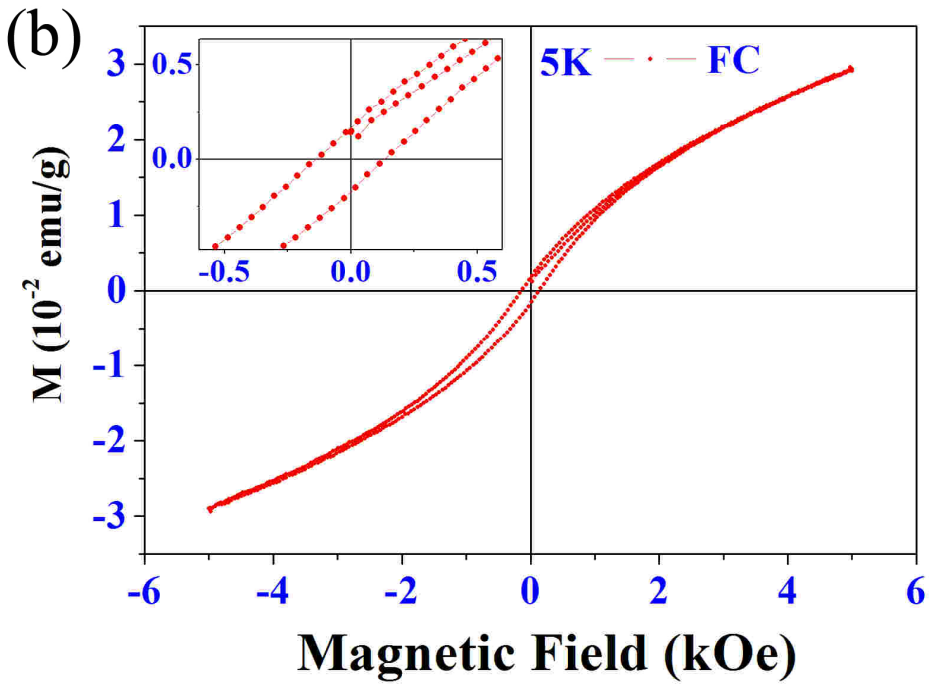
SI-3. Bright field (a) and (b), and dark field (c) TEM images of ultrafine 1D peashell-like MgO nanostructures

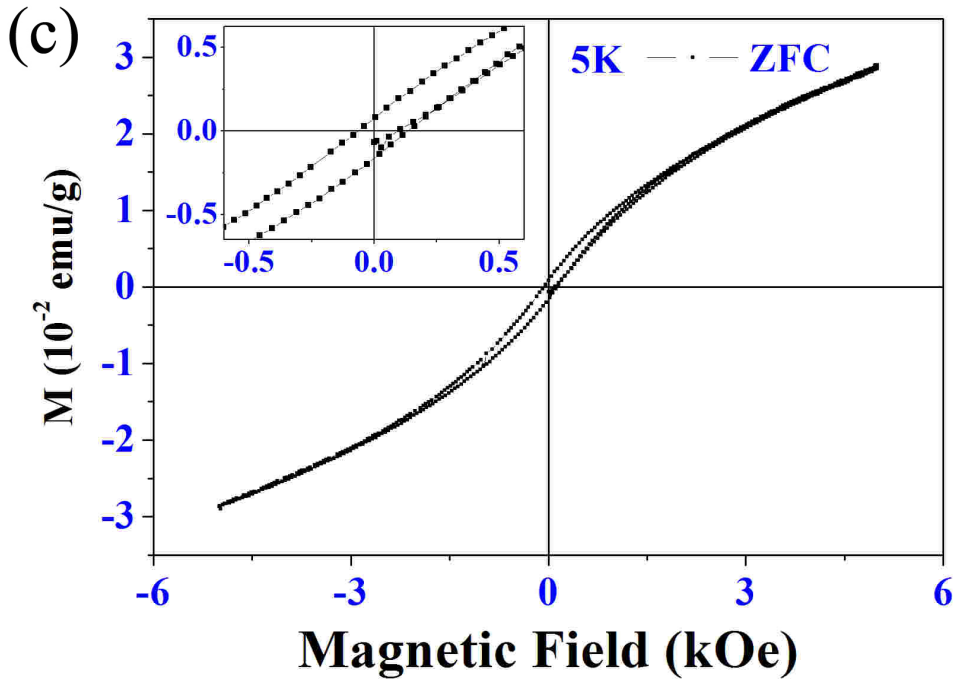




SI-4. Room temperature magnetic hysteresis image of 1D peashell-like MgO nanostructures (a); and Field-cooled (b) and zero-field-cooled (c) hysteresis loop images of 1D peashell-like MgO nanostructures at 5 K






(c)
5K — · — ZFC
M (10^{-2} emu/g)
Magnetic Field (kOe)
3
2
1
0
-1
-2
-3
-6
-3
0
3
6
0.5
0.0
-0.5
-0.5
0.0
0.5