Supplementary Material (ESI) for Chemical Communications

Supplementary information

BN Tubular Layers-Sheathed CaS:Eu^{2+} Nanowires as Stable Red Light-Emitting Nanophosphors

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Experimental Section

Synthesis. The BN-coated CaS:Eu nanowires were synthesized in a vertical induction furnace. The furnace consisted of a fused quartz tube and an induction-heated cylinder made of high-purity graphite coated with a carbon fiber thermo-insulating layer, and had two inlets on its top and base, and one outlet on its side. A graphite crucible containing a mixture of $CaSO_4$, Eu_2O_3, activated carbon and B_2O_3 powders was placed in the center cylinder zone. The doping concentration of Eu^{2+} is 1 mol % with respect to a Ca^{2+} ion. After evacuation of the quartz tube to 2×10^{-1} Torr, two pure N_2 flows were introduced through the inlets at a flow rate of 1.5 L/min (top) and 1.0 L/min (base), respectively. Then the furnace was rapidly heated to ~1350^{o}C and kept at this temperature for 1 h. The Eu^{3+} ions in the starting Eu_2O_3 powder were reduced to Eu^{2+} via the reaction with activated carbon under the N_2 atmosphere, which is confirmed by the excitation and

emission spectra given later. After the system was cooled to room temperature a pink-colored wool-like product was collected.

Structural Characterization. The product was characterized by a scanning electron microscope (SEM, JEOL, JSM-6700F), a powder X-ray diffractometer (XRD, RIGAKU, Ultima III, 50 V/40 mA with Cu Ka radiation) and a transmission electron microscope (TEM, JEM-3000F) equipped with an energy-dispersive X-ray analyzer (EDX) and an electron energy loss spectrometer (EELS).

Photoluminescence Characterization. Excitation and emission spectra were measured at room temperature by using a Hitachi Fluorescence Spectrophotometer (F-7000). The quantum efficiency of the samples was measured with a 200 W Xe lamp as an excitation source and a Hamamatsu MPCD-7000 multichannel photodetector.

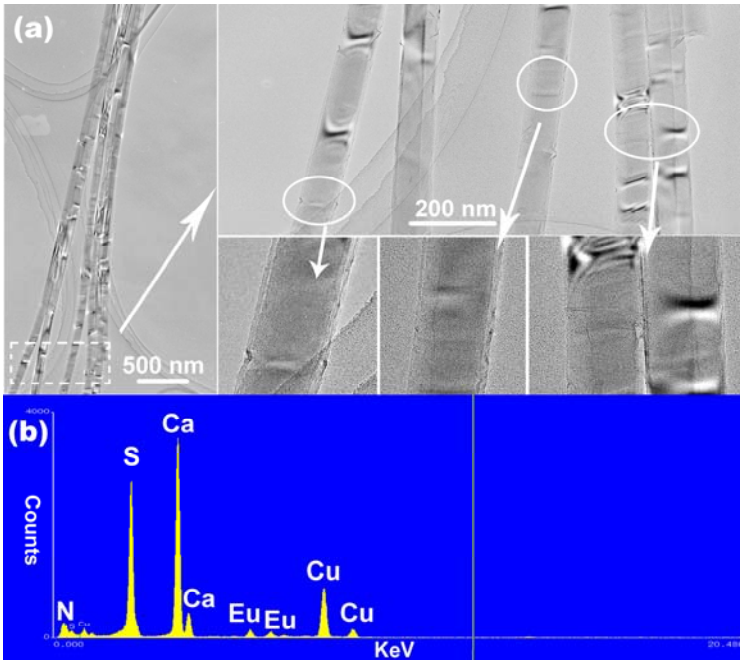

Fig. S1 (a) TEM images of several nanowires, showing that all of them are sheathed with BN layers. (b) A typical EDS spectrum taken from the individual nanowire in (a).

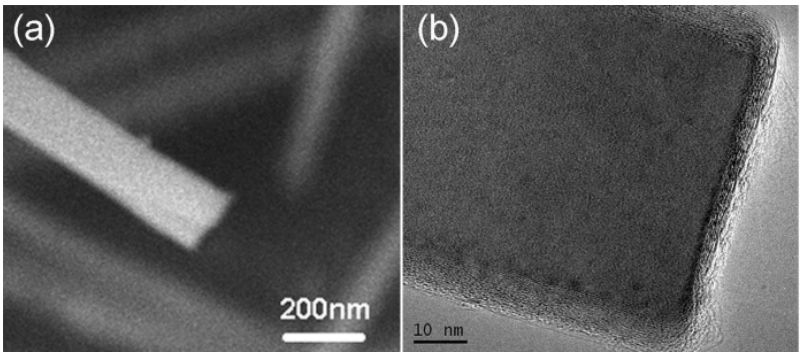

Fig. S2 SEM (a) and TEM (b) images showing BN-coated flat nanowire tips. The nanowires are entirely sealed with BN layers that effectively prevent their decomposition.

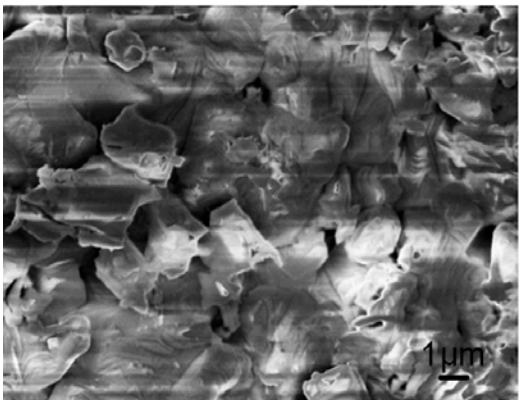

Fig. S3 SEM image of an uncoated bulk CaS:Eu crystal fabricated without use of boron oxide.

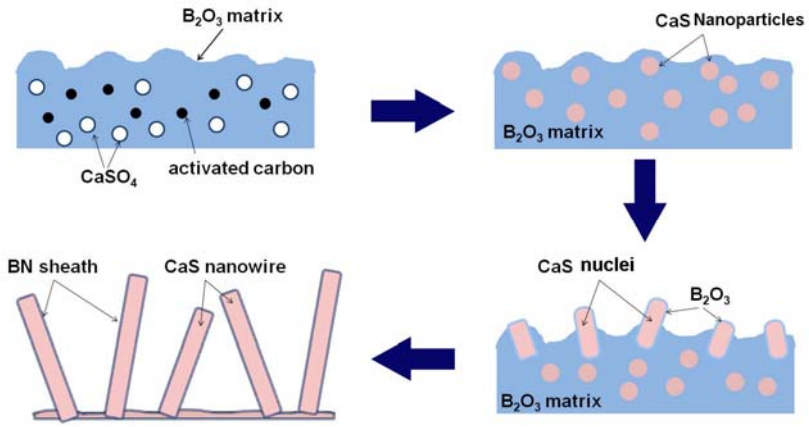

Fig. S4 Schematic illustration of the nanowire growth mechanism.