

character for the wurtzite-to-sphalerite transformation. These surprising observations are quite different from the standard slow transition kinetics observed in the bulk and ZnS nanoparticles.

It is difficult to understand these intriguing results from the viewpoint of classical thermodynamics and/or nanosize-confinement effects. However, surface-energy considerations provide a new angle that is useful to explain this behaviour. Their high surface-to-volume ratio, coupled with the fact that each nanobelt is a single crystal, make surface effects very prominent in such materials, and have been shown to greatly modify equilibrium structure and phase stability for nanosized materials. Therefore, when reducing nanocrystal size, surface energy starts to significantly affect the structural stability.

Wang *et al.* attribute the exceptional wurtzite-ZnS structural stability to the particular nanobelt morphology. The wurtzite-ZnS nanobelt represents a structure with a lower surface energy than the sphalerite-ZnS nanoparticles, because the lowest-energy plane in the wurtzite structure corresponds to the largest surfaces (top and bottom) of the nanobelts, in direct contrast to the sphalerite structure. They also find that the nanobelt thickness plays the key role in their structural stability: below a critical thickness of 7.4 nm, a wurtzite nanobelt is found to be more stable than sphalerite. This is easily understood, because as the nanobelt thickness is reduced, the surface-to-volume ratio increases, thereby increasing the relative importance of surface-energy factors. In addition, structural twins and faults may provide further stabilization.

The results provide new insights into the nanobelt-morphology-tuned wurtzite-ZnS stabilization and wurtzite-to-sphalerite phase

transformation mechanisms within a given nanoscale object. It also represents an important step towards harnessing nanoscale semiconductor morphologies for phase and property optimization⁸. It indicates that at ambient conditions, metastable semiconductor structures with superior properties can be achieved by careful control of surface, morphology and size, among which the surface energy is the most important factor to be considered. This observation is important for manipulation of the structure and properties of ZnS nanoscale semiconductors. Moreover, because most important II–VI and III–V group wide-bandgap semiconductor materials have analogous cubic and hexagonal structural forms, which display different properties suitable for different applications, the observations by Wang *et al.* have implications in the synthesis and designs of other semiconductor nanomaterials.

The work by Wang and colleagues gives us an idea of how to optimize phase and properties by selecting suitable morphology. The proposals raised by the authors will stimulate new strategies and experiments with potential technological applications. However, the puzzle of the morphology control of nanoscale semiconductors is very complicated. The influence of the morphology (surface, size, shape, crystallographic characters) on the phase and properties needs to be understood in much greater detail.

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ERRATUM

TURBULENCE AHEAD

RUSSELL COWBURN AND DOROTHÉE PETIT
Nature Materials **4**, 721–722 (2005).

In this News and Views piece, Figure 1b was incorrect. It should have appeared as shown here.

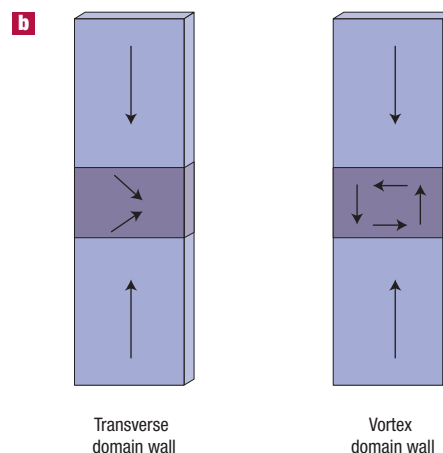


Figure 1 b, Transverse and vortex domain walls in nanowires.