Vanadium dioxide (VO$_2$) nanostructures that exhibit a switchable metal-insulator transition are difficult to synthesize in solution, in part because there are several closely related VO$_x$ compounds with similar structures and compositions.

We circumvented this bottleneck by growing VO$_2$ epitaxially on the tips of nanorods of TiO$_2$, which is structurally similar to the targeted VO$_2$ phase.

Four distinct types of VO$_2$–TiO$_2$–VO$_2$ nanostructures were accessible, and the metal-insulator transition temperature was tunable based on the sizes of the VO$_2$ domains and the characteristics of the VO$_2$-TiO$_2$ interfaces.