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Using surfaces, ligands, and dimensionality to obtain desired nanostructure properties PRASHANT NAGPAL, VIVEK SINGH, YUCHEN DING, University of Colorado — Nanostructured materials are intensively investigated to obtain material properties different from their bulk counterparts. It has been demonstrated that nanoscaled semiconductor can have interesting size, shape and morphology dependent optoelectronic properties. But the effect of surfaces, ligands and dimensionality (0D quantum dots to 2D nanosheets) has been largely unexplored. Here, we will show how tuning the surface and dimensionality can affect the electronic states of the semiconductor, and how these states can play an important role in their fundamental photophysical properties or thermal transport. Using the specific case for silicon, we will show how "new" surface states in small uniform can lead to light absorption/emission without phonon assistance, while hindering the phonon-drag of charge carriers leading to low Seebeck coefficient for thermoelectric applications. These measurements will shed light on designing appropriate surface, size, and dimensionality for desired applications of nanostructured films.

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