

Nanowires for Photonic Applications

Abstract

Nanowires have the potential to be easily integrated into nanoelectronics and nanophotonic systems, which could lead to improved industry performance. Their chemical compositions, lengths, and diameters (structural properties) significantly influence their electronic and optical characteristics. Based on their applications, plasmonic and photonic devices often use dielectric and metallic nanowires. For sensing and light-emitting devices, semiconducting nanowires are used. These characteristics are due to the fact that there are quantum restrictions of the electron in nanowires, which results in inhibition in the energy levels different from in bulk materials. This chapter presents the theory, synthesis, and fabrication of nanowires for use in the photonic industry. Also presented are efforts being made to integrate nanowires as components in photonic structures while highlighting the scientific and technological challenges with their possible solutions. Finally, a projection into the future direction of nanowire application in the photonic industry is also presented and discussed.