

# Semiconductor Nanorods Have Been Studied Progressively In Recent Years

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## Description

In recent decades, the one-dimensional nanostructure of nanorods found in semiconductors has outperformed other nanostructures in a variety of applications due to its distinctive behavior. The results of extensive research show that nanorods with a larger surface area have a lower Auger rate, a longer carrier lifetime, and linearly polarized emission. In recent years, increasing numbers of semiconductor nanorods and the promising advanced material metal halide perovskites have been studied. Perovskite nanorods' most recent development is rarely discussed due to their extensive use in a variety of applications. Starting with the early appearance of semiconductor nanorods and their development over time, this review examines recent developments in metal perovskite nanorods. In this way, the combination strategies and a few factors that direct the last morphology of the nanocrystals are clarified. Following a discussion of the fascinating applications of perovskite nanorods in energy devices, photodetectors, and other optoelectronic devices, the difficulties in the creation of metal halide perovskite nanorods are addressed. The review's conclusion and our outlook on the material's future development are then presented. Anthracene nanorod is described as thermally stable, crystalline, electrically conducting, and brightly fluorescent (emiss = 10%). The conjugated crystalline anthracene nanorod is characterized using HRSEM, TEM, AFM, FTIR, Raman, and XPS with an average length of 206 nm and width of 39 nm. DFT studies reveal that the nanorod's anthracene unit count can change the bandgap.

## Anthracene Nanorod

The acetylenic linkages have a higher electron density than the peripheral anthracenes, as shown by the electrostatic potential maps, indicating a delocalization of the  $\pi$ -electron cloud. An extended conjugation in the anthracene nanorod accounts for its significant electrical conductivity in comparison to the monomer. Additionally, the material's crystalline nature and high thermal stability are confirmed by TGA analysis and SAED pattern, respectively. Above all, the presence of rods of varying lengths accounts for the anthracene nanorod's excitation-dependent emission in the range of 433–567 nm. Anthracene nanorods are the only known 1D nanomaterial with covalent linkages, in contrast to the organic nanorods that are already in existence and are formed through  $\pi$ - $\pi$  stacking

induced self-assembly. For selective partial oxidation of methane, electrochemical conversion looks promising. To improve electrochemical conversion, we present a nanorod catalyst with a NiO/ZnO core and shell. The nanorods' 1D morphology and inherent potential at the NiO/ZnO interface facilitate rapid charge transfer, enhancing electrochemical methane conversion. With a 600-nm-long NiO/ZnO nanorod catalyst, we were able to achieve a selectivity of 81% and a high ethanol production rate of 1084.2 mol/gNiO/hr. The dissociative adsorption of the anionic  $\text{CO}_3^-$  oxidant, the formation of methanol through methane activation, and the coupling of deprotonated methanol and methane were all suggested as possible pathways for the production of ethanol in mechanistic analyses using isotopic labeling reactions. In addition, by increasing the solubility of methane in sulfolane cosolvent mixtures, we increased the yield of ethanol. In addition, we demonstrated conversion by in situ generation of  $\text{CO}_3^-$  from a mixture of  $\text{CH}_4$  and  $\text{CO}_2$ . Researchers must investigate how to immobilize photocatalysts on supporting substrates to prevent the deterioration and loss of photocatalytic performances. However, common synthesis methods like hydrothermal, sol-gel, and chemical vapour deposition are time- and cost-inefficient.

When heat generated outside the reactor is transferred into the reactor and precursor solution, a significant amount of heat is lost to the environment. ZnO nanorods were grown using the Direct Heating (DH) method on kanthal wires in this study. When compared to common synthesis methods like hydrothermal, sol-gel, and chemical vapor deposition, the DH method produces ZnO nanorods with many advantages. The heat was generated directly on the substrate, resulting in efficient heating, a low electric consumption of less than 0.060 kWh, and a quick synthesis of ZnO nanorods in just 15 minutes. XRD, FESEM, TEM/HRTEM, XPS, and RTPL analyses all confirm the presence of ZnO nanorods on kanthal wires. Under UV light, the photocatalytic degradation of RhB dye and heavy metal ions by the ZnO nanorods was effective. As a result, DH has the potential to be a synthesis method for mass producing a module for wastewater treatment. Palladium nanowires can now be synthesized template-free within the central channel of a variety of lengths of Tobacco Mosaic Virus (TMV) nanorods. By using the capping reagent poly (vinyl-pyrrolidone) (PVP30K) and reducing the metal precursor to metallic palladium with ascorbic acid, we demonstrate that uniform Pd NWs with a diameter of 4 nm can be produced by selective growth within these channels. Either by altering the reaction conditions or by altering the length of

the nanorod templates, one can control the length of the Pd NWs. In addition, we have demonstrated the in-situ metallization of TMV nanorods by bimetallic gold (Au)-palladium (Pd), which results in the production of Pd NWs 6 nm gold nanoparticles attached to their ends. The materials created have numerous expected applications in the development of nanoscale gadgets.

## Zno Nanorods

Mesoporous alumina nanorods were successfully produced using a straightforward synthesis technique. Several instruments, including XRD, SEM, and HRTEM, were used to demonstrate the brand-new mesoporous alumina nanorods. The anticancer medication doxorubicin hydrochloride, or DOX, was found to adsorb well on the prepared alumina nanorods. The DOX's adsorption mechanism was examined in relation to changes in temperature, pH, and concentration. The adsorption capacity of alumina nanorods for DOX was found to be higher at pH 6.0, as demonstrated by experimental data. In addition, the adsorption equilibrium demonstrated that, in comparison to the other models, Langmuir adsorption provided the best fit to the extracted data. The chemisorption movement is supported by the measurement of the activation energy of adsorption for DOX's adsorption onto alumina nanorods. The well-known pseudo-second-order kinetic model demonstrated the adsorption kinetics. Endothermic and spontaneous thermodynamic modules were used to record the adsorption measurement. We looked into how DOX adsorbs onto alumina nanorods from real water samples (tap water, effluent wastewater, and influence wastewater). Alumina nanorods seemed like a good option for adsorbing DOX and treating wastewater, according to the findings. The development of membrane separation is dependent on the customization of high-performance nanofiltration membranes that are capable of overcoming the trade-off effect. An effective solution to this problem is thought to be to build an intermediate layer between the support layer and the selective layer to speed up the transport of water. However, it is still difficult to make interlayered Thin-Film Composite membranes (i-TFCs) on non-polar substrates with a lot of pores and porosity. FeOOH nanorods serve as interlayers in the high-performance i-TFC

membrane we present here. The membrane's mechanical strength and water transport pathways were significantly enhanced by the porous and robust nanorods. The i-TFC membrane maintained a high pure water presence of up to 48.9 while maintaining a high salt rejection of over 96% at the high pressure of 20 bars. A 23-nm-thick polyamide layer devoid of nanorod structures was produced as a result of the substrate's increased hydrophilicity and compactness being enhanced by the presence of nanorods. Three distinct hydrophobic substrates further demonstrated the strategy's adaptability.

As a result, this work will shed more light on the creation of high-performance membranes for molecular separation. Electrospinning produced nanofibers containing ZnO nanorods and a variety of copper salts, and their antiviral responses to visible light were studied. HR-TEM was used to study the morphologies of ZnO nanorods, and UV-vis spectroscopy was used to measure the optical properties. SEM and X-ray spectroscopy were used to characterize the electrospun nanofibers, and x174 was used to evaluate the antiviral properties of the fabricated Cu-ZnO/PAN nanofibers when exposed to visible light. Due to ZnO nanorods acting as a photocatalyst, the nanofibers containing CuBr and ZnO nanorods prevented Cu (I) oxidation into inactive Cu (II). As a result, the nanofibers were highly effective against viruses. To achieve high sensitivity and reproducibility, conventional Surface-Enhanced Raman Scattering (SERS) substrates require intricate fabrication methods and valuable nanometals. Additionally, the reusability of the substrate remains a challenge because SERS necessitates the adsorption of analytes on it. As a highly sensitive, recyclable, and cost-effective SERS substrate, gold nanostructured CuO nanorods have been developed here. CuO nanorods were simply made by thermal oxidation at 500 °C on Cu wire for the fabrication. The UV photoreduction method was then used to decorate the surface of the CuO nanorod with Au nanostructures. Methylene blue could be detected at a concentration as low as 0.1 pM on the prepared Au-CuO substrate, and even after recycling the substrate three times with UV light, the substrate's SERS activity remained approximately 80 percent. After three days of exposure to the ambient environment, the substrate's surface stability was also evaluated, and the decrease in SERS signal was only 4.7%.