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Growth and Characterization of GaN Nanowires for Photoelectrochemical Water Splitting

This study's aim is to explore the use of Gallium Nitride (GaN) nanowires (NWs) for photoelectrochemical water splitting. GaN's wide bandgap may offer a route for hydrogen production using solar energy. However, growth challenges, such as high defect densities, hinder its efficiency. Nanowire structures offer a solution due to their low defect density and efficient strain relaxation. We grew GaN NWs using Metalorganic Vapor-Phase Epitaxy and characterized them via Scanning Electron Microscopy, Atomic Force Microscopy and Raman scattering. Results showed well-ordered hexagonal nanowires with detailed edge resolution. We estimated transverse diameters dx ~735.7 nm and dy~686 nm. Raman spectroscopy highlights the presence of surface modes typical of GaN nanowires, which may give key insights on the GaN nanowire behaviour under high magnetic field or electrical current. Future investigations using KPFM and Electron Paramagnetic Resonance, will deepen the understanding of the functional responses of GaN NWs governed by their charge carriers.

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