

### Structural and optical properties of flower and needle-shaped ZnO nanostructures by ALD

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A novel method, atomic layer deposition is employed to grow the needle and flower-shaped ZnO arrays at different growth temperatures. The needle shaped nanostructures were grown on the Au catalyzed Si(100) substrate while the flower-shaped was grown without metal catalyst on Si(100) substrate. The high density needle-shaped ZnO nanostructures were confirmed using the field emission electron microscopy. Investigations using the high resolution transmission electron microscopy and selected area electron diffraction patterns confirmed that the as-grown nanostructures are single crystalline with wurtzite hexagonal structure and preferentially oriented in the c-axis direction. Optical properties of these structures were measured at room temperature by photoluminescence spectroscopy. The needle-shaped and flower shaped nanostructures show a broad band in the visible region with suppressed UV emission. It is indicating that these nanostructures have structural defects (oxygen vacancies and zinc interstitials etc).