

## Low temperature growth of well-aligned ZnO nanorod array using a novel solution method

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In this work, we developed a novel ammonia aqueous solution method for growing well-aligned ZnO nanorod array on silicon substrate. For ZnO nanorod growth, thin zinc metal seed layer was deposited on silicon substrate by thermal evaporation. Uniform ZnO nanorods were easily grown on the zinc-coated silicon substrate in aqueous solution containing zinc nitrate and ammonia water. The growth temperature was as low as 60 ~ 90 °C and four-inch wafer size scale-up was possible. The morphology of zinc metal seed layer, pH, growth temperature, and concentration of zinc salt in aqueous solution were important parameters to determine the growth characteristic such as average diameters and lengths of ZnO nanorods. We could also demonstrate the discrete controlled growth of ZnO nanorods using sequential, tailored growth steps. Combining our novel solution method and general photolithography, we selectively grew ZnO nanorod arrays on patterned silicon substrate.