

Lateral-growth of ZnO nanorods in solution for high performance field-effect transistors

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We have exploited a method for the lateral-growth of multiple ZnO nanorods between electrodes in solution without the use of a metal catalyst to fabricate high performance field-effect transistors (FETs). This method enables us to directly align overlapped or overlap-free nanorods between electrodes by eliminating the vertical growth components and complex structural networks. The overlap-free ZnO nanorod FETs showed better performance with a mobility of $\sim 8.5 \text{ cm}^2 \text{ V}^{-1} \text{ S}^{-1}$ and an on/off ratio of $\sim 4 \times 10^5$ than the overlapped ZnO nanorod FETs having a mobility of $\sim 5.3 \text{ cm}^2 \text{ V}^{-1} \text{ S}^{-1}$ and an on/off ratio of $\sim 3 \times 10^4$. All the FETs fabricated in this work showed much better performance than the previously reported solution-based ZnO FETs. Overlapped or overlapped-free ZnO nanorods FETs can serve as a useful platform for the fundamental understanding and future practical applications of solution based nanorods TFTs, gas-sensor, bio-sensor, MESFET, high performance FETs, LED, detector and electrical devices.