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# Controlling Hydrophobic/Hydrophilic Properties of ZnO Microtetrapods Structures by Means of Thermal Treatment

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## Abstract

We report on possibilities to convert, by means of thermal treatment, the wettability properties of networks consisting of ZnO microtetrapods from hydrophobic to super-hydrophilic. The ZnO microtetrapods were produced by flame transport synthesis. The ZnO powder containing the ZnO tetrapods were pressed in pellets with the density of 1 g $cm^{-3}$ using a compression mold. The comparative study was performed on two sets of samples, and namely: the as-grown ZnO tetrapods pressed in pellets and the annealed pellets. The wettability conversion proved to be an irreversible process for a long period. As a result, the thermal treatment process not only increase the mechanical stability of the ZnO pellets but also essentially increase the hydrophilic behavior of ZnO tetrapods, which is a very important issue for further chemical or electrochemical functionalization. Apart from wettability characteristics investigated by Water Contact Angle (WCA) measurements, the structural and optical properties were investigated by X-ray diffraction (XRD) and photoluminescence (PL) techniques, respectively. The XRD patterns revealed the hexagonal wurtzite structure and a high structural quality of both as-grown samples and annealed networks of microtetrapods at 950 °C. Their high quality was also confirmed by the presence of PL bands related to exciton recombination in the emission spectrum. The possible nature of other PL bands, especially green emission band attributed to specific recombination channels and their evolution with thermal treatment are discussed.

*Keywords: zinc oxide microtetrapods, flame transport synthesis, scanning electron microscopy, photoluminescence*


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