Facile route to grow crystalline ZnO nanorod arrays via corrosion and their photocatalytic activity under visible Light

Danish Iqbal[1] *& Andreas Erbe*[1]

1 Max-Planck-Institut für Eisen Forschung GmbH, Max-Planck-str.1, 40237, Düsseldorf, Germany; d.iqbal@mpie.de

Keywords: ZnO nanostructure, hydrothermal synthesis, corrosion, photocatalysis

One dimensional (1D) ZnO nanostructures have been extensively researched by material scientists in the past few years as they possess fascinating properties superior to their bulk counterparts, which makes them potential materials for future nanoscale electronic and optoelectronic devices. In order to produce high performance 1D ZnO based nano devices, the synthesis of high quality ZnO nanorods is desired. This lead to the development of methods to synthesize high quality 1D ZnO nanostructures, such as chemical vapor deposition (CVD)[1], vapor-liquid-solid growth (VLS)[4] and hydrothermal approach.[2, 3] These approaches require higher synthesis temperatures (> 100 °C), sophisticated equipment and rigorous experimental conditions which inevitably complicate the fabrication process and increase the cost of production. Although the oxidation of natural zinc in formamide aqueous solution at higher temperatures (65 °C) has been employed to grow ZnO nanorods[5], corrosion driven fabrication of ZnO nanorods at room temperature in aqueous solution have never been observed to the best of our knowledge.

Here, we report the strategy for fabricating highly oriented, compact hexagonal 1D ZnO nanorod arrays over large area via a simple tailored corrosion route of zinc at room temperature. This novel synthetic approach allows further reduction of growth temperature to room temperature, leading to the development of simple and feasible fabrication process for high-quality ZnO 1-D nanostructures. Moreover, we demonstrate that the defect rich tailor made ZnO nanorods mediate the visible light induced photodegradation of methyl orange.

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