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Synthesis of Li doped NiO hierarchical porous NiO nanosheets and its electrochemical properties

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Nanostructure anodic transition-metal oxide materials have attracted significant interests in research community in solar energy conversion, electrochromic devices, and lithium-ion batteries due to its superior electrical, optical and electrochemical properties. Among those transition-metal, NiO is the most investigated electrochromic materials owing to its low cost, excellent chemically stability, superior electrochromic properties, and high optical density variation. However, the unsatisfied cycling stability and performance of electrochromic NiO material compared to the best benchmark electrochromic materials WO_3, limiting its potential commercialization. With regard to these, several efforts to fabricate high-quality NiO materials have been done to improve its electrochemical properties. In this study, undoped and lithium-doped nickel oxide (NiO) hierarchical porous nanosheets are developed via a facile hydrothermal growth. The structure of the synthesized nanosheets is indexed precisely to a NiO bunsenite structure. This study investigates the effects of Li doping concentration on the morphology, as well as the electrical and electrochromical properties, of the nanosheets. The SEM image shows a well-defined hierarchical porous structure of the NiO nanosheets. The resistivity of Li:NiO nanosheet with 0.11 mol% Li doping was 594 Ωcm, which is 13.2 times lower than undoped NiO nanosheet (7825 Ωcm), indicating excellent electrical properties via Li doping. Cyclic voltammetry test (CV) revealed that the nanosheet sample with 0.06 mol% Li doping exhibited the highest current density of 0.92 mA at a sweep rate of 100 mVs-1, which is 1.4 times and 15.3 times greater than that of undoped NiO nanosheet and NiO thin film, respectively.

Biography

K. N Hui earned a BSc degree in Physics from The Hong Kong University of Science and Technology in 2003 and a PhD degree in Electrical and Electronic Engineering from The University of Hong Kong in 2009. Dr. KN Hui is an assistant professor in the Department of Materials Science and Engineering of Pusan National University, Korea. His current research focuses on the development of p-type ZnO based thin film and nanorods structure for high power GaN LEDs, and nanomaterials for air purification. He has published 38 papers in leading journals and 44 conference proceedings, contributed to 1 US and 5 KR patents.

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